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DOE/RL-90-12

Request for Interim Approval to Operate 218-E-12B Trench 94 as a Chemical Waste Landfill for Disposal of Polychlorinated Biphenyl Wastes in Submarine Reactor Compartments

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Department of Energy
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ABBREVIATIONS AND ACRONYMS

AMSL	above mean sea level
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
DOE-RL	U.S. Department of Energy-Richland Operations Office
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
LLBG	Low-Level Burial Grounds
LLWMA-2	Low-Level Waste Management Area-2
PCB	polychlorinated biphenyl
SRC	submarine reactor compartment
Trench 94	Trench 94 of the 218-E-12B Burial Ground
TSCA	Toxic Substances Control Act

1.0 INTRODUCTION

This request is submitted to seek interim approval to operate a chemical waste landfill for the disposal of polychlorinated biphenyl (PCB) wastes. Interim approval is requested for a period not to exceed 5 yr. This request covers only the disposal of small quantities of solid PCB wastes contained in decommissioned submarine reactor compartments (SRC). In addition, the request applies only to disposal of these wastes in Trench 94 of the 218-E-12B burial ground (Trench 94) in the 200 East Area of the U.S. Department of Energy (DOE) Hanford Site. Disposal of these wastes will be conducted in accordance with the Memorandum of Agreement between the DOE Richland Operations Office (DOE-RL) and the U.S. Environmental Protection Agency, Region 10 (EPA). During the 5-yr period covered by this request, the DOE-RL will seek final approval for operation of Trench 94 as a chemical waste landfill, including any necessary waivers, and will also seek a final dangerous waste permit from the Washington State Department of Ecology (Ecology) for disposal of lead contained in the SRCs.

Operation of a chemical waste landfill for disposal of PCB wastes is subject to the *Toxic Substances Control Act* (TSCA) and must comply with the TSCA regulations at 40 CFR 761. This request demonstrates how Trench 94 will be operated to comply with the applicable TSCA requirements, specifically the requirements for chemical waste landfills under 40 CFR 761.75. Chapter 2.0 provides general background and history related to operation of Trench 94 for disposal of SRCs. Chapter 3.0 provides information on site characteristics, especially those which are relevant to compliance with TSCA requirements. A description of the wastes received at Trench 94 is given in Chapter 4.0. Chapter 5.0 provides an operation plan for Trench 94, as required under 40 CFR 761.75(b)(8)(ii). Chapter 6.0 addresses the risk associated with operation of Trench 94 for the 5-yr interim approval period in accordance with the operation plan. Chapter 7.0 demonstrates how operation of Trench 94 during the interim approval period will comply with specific requirements under 40 CFR 761.75. This section also describes how the DOE-RL is seeking waivers for liner, leachate collection system, and groundwater monitoring requirements for the interim approval period. These requests for waivers are made in Chapter 8.0. The requests indicate, as demonstrated in Chapter 6.0, that operation of Trench 94 during the interim approval period without a liner and leachate collection system, and with the existing site groundwater monitoring program will not present an unreasonable risk to human health and the environment.

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2.0 GENERAL BACKGROUND AND HISTORY

The 218-E-12B burial ground is in the 200 East Area of the DOE Hanford Site. It began receiving wastes in 1967 and consists of 94 trenches covering 173.1 acres. Wastes contained in this burial ground include mixed waste, low-level radioactive wastes, and transuranic wastes. Trench 94 is to be used for final disposal of U.S. Department of the Navy (Navy) defueled SRCs. The first SRC was placed in Trench 94 in April 1986 and the trench currently contains eight SRCs. Trench 94 should continue to receive approximately five to six SRCs per year for approximately the next 20 yr.

Each SRC is that section of the submarine hull containing the nuclear reactor plant. The nuclear reactor plant consists of the reactor vessel, steam generators, pumps, valves, and piping. The compartments are completely sealed to prevent release of the radioactive and hazardous materials contained within them. All nuclear fuel has been removed from the SRCs; therefore, the radioactive materials remaining in the SCRs consist only of activation products from operation of the nuclear reactors. The hazardous materials remaining in the SCRs include small amounts of cadmium and asbestos in thermal insulation and PCBs. In six of the eight SRCs, the PCBs are present in high amounts in sound-damping felt that is interior to the hull. In all of the eight SRCs, PCBs are present in minor amounts (less than 3 lb) in solid form in common industrial components (i.e., electrical cables, insulation and rubber items). In addition, lead in the form of lead shielding will also remain in the SRCs and is a dangerous waste regulated by Ecology under the State's dangerous waste regulations.

The DOE-RL is currently seeking a dangerous waste permit for eight low-level burial grounds (LLBG), one of which is the 218-E-12B burial ground. The PCB items are PCB wastes, which are regulated by the EPA. The Navy has agreed to remove all of the PCB-containing sound damping felt from the six SRCs at the Hanford Site requiring cleanup. This cleanup will be accomplished by mid-1990. Two of the SRCs were cleaned prior to shipment to Hanford, and in the future, this material will be removed from any other SRCs before shipment to Hanford. The other PCB materials (i.e., electrical cables, insulation, and rubber items) will remain in the SRCs, and the DOE-RL is seeking approval to dispose of this material in Trench 94. Disposal of the small quantities of other hazardous materials contained in the SRCs is not regulated.

At the time that the SRCs were first placed in Trench 94, the Navy was unaware of the large amounts of PCB present in the felt. Upon discovery of the presence of PCBs in the SRCs in 1989, the Navy committed to Ecology to remove the PCB felt from the SRCs by mid-1990. At that time, the Navy also did an extensive review of the materials remaining within the SRCs to identify any other potentially regulated materials. The only such materials identified were items that contain small amounts of PCB.

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3.0 SITE CHARACTERISTICS

This chapter describes site characteristics of the 218-E-12B burial ground in general, and Trench 94 in particular. The characteristics described are mainly those which are of importance with respect to compliance with TSCA chemical waste landfill requirements. These characteristics include geology, hydrology, topography, land use, climate, and a description of Trench 94.

3.1 GEOLOGY/HYDROLOGY

The 218-E-12B burial ground is located within the 200 East Area of the Hanford Site. The Hanford Site is located in the Pasco Basin within the Columbia River Basalt Plateau. The Pasco Basin appears to have been formed by slow continuous subsidence coupled with periodic flooding with basaltic lava flows. As the anticlinal ridges to the south of the basin rose, they obstructed the flow of the Columbia River, flattening the gradient and causing deposition of alluvial deposits known as the Ringold Formation. The river then began to incise a channel through the ridge and lowered its base elevation, subsequently eroding the Ringold Formation. Later, catastrophic floods of glacial meltwater flowed through the Pasco Basin depositing glaciofluvial sediments known as the Hanford formation.[1] More recently, the site has received eolian deposits, with the formation of dunes at some locations.

The LLBG have been grouped in the *LLBG Dangerous Waste Permit Application* (DOE-RL 1989) into hydrologic waste management areas for the purpose of establishing groundwater monitoring programs. The 218-E-12B burial ground is within Low-Level Waste Management Area-2 (LLWMA-2). The hydrogeology of the LLWMA-2 is described in more detail by Last et al. (1989). The stratigraphy at LLWMA-2 is summarized in Figure 3-1. Geologic cross-section information for LLWMA-2 is presented in Figures 3-2 through 3-6.

As shown in the geologic cross sections, LLWMA-2 is underlain by gravelly sands, sands, and sandy gravels of the Hanford formation. Information on the hydraulic conductivity of saturated portions of the Hanford formation, as determined from aquifer tests, is presented by Last et al. (1989, p. 6.8). These results show a range of hydraulic conductivity from 0.46 to 2.4 cm/s.

As shown in the geologic cross sections, the depth to groundwater in the vicinity of LLWMA-2 is generally about 200 ft. Well 34-4, which is near Trench 94, has a surface elevation of 612 ft and a depth to water table of 206 ft (Last et al. 1989, p. 5.11). A water table map for LLWMA-2 is shown in Figure 3-7.

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[1]Unlike the Ringold Formation, the Hanford formation is not recognized by the Commission on North American Stratigraphic Nomenclature; hence the difference in capitalization.

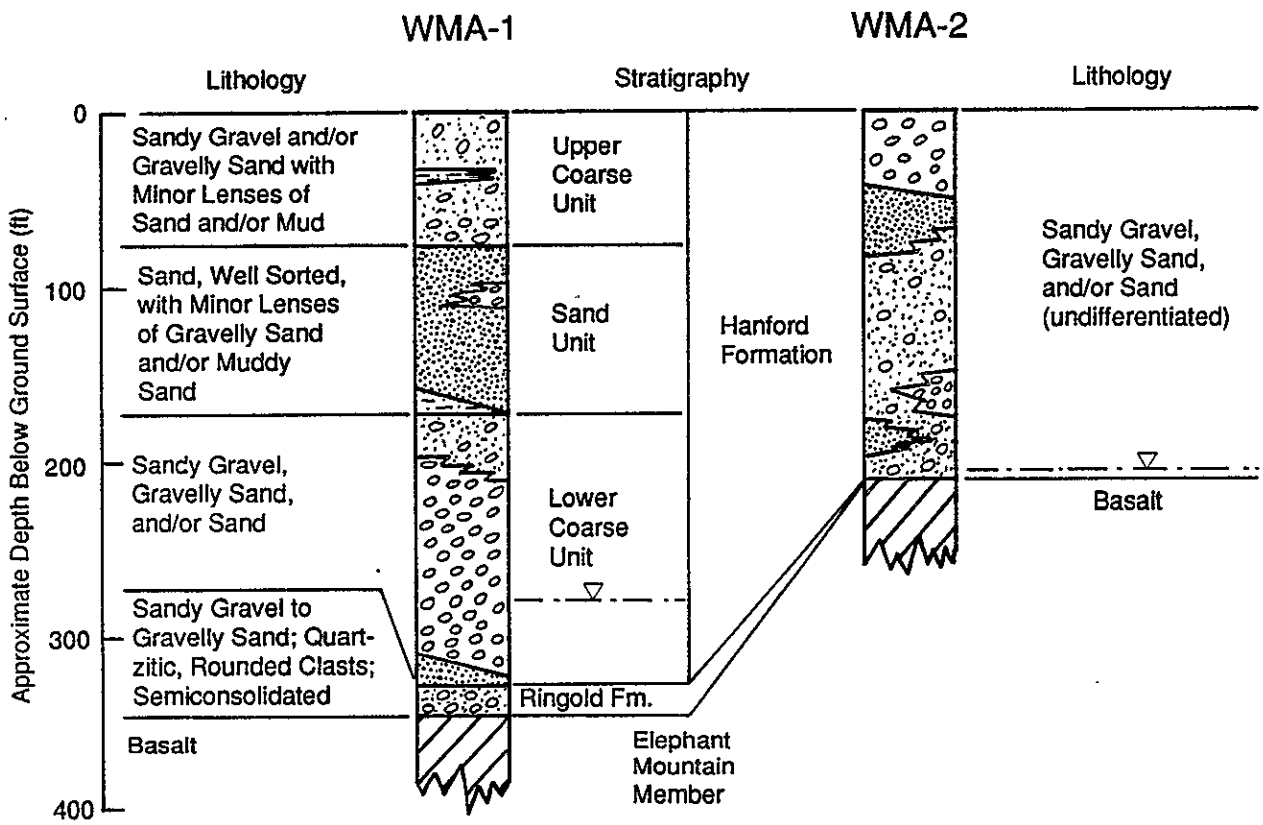

Figure 3-1. Generalized Stratigraphy for Low-Level Waste Management Areas 1 and 2 (Source: Last, et al. 1989, p. 5.12).

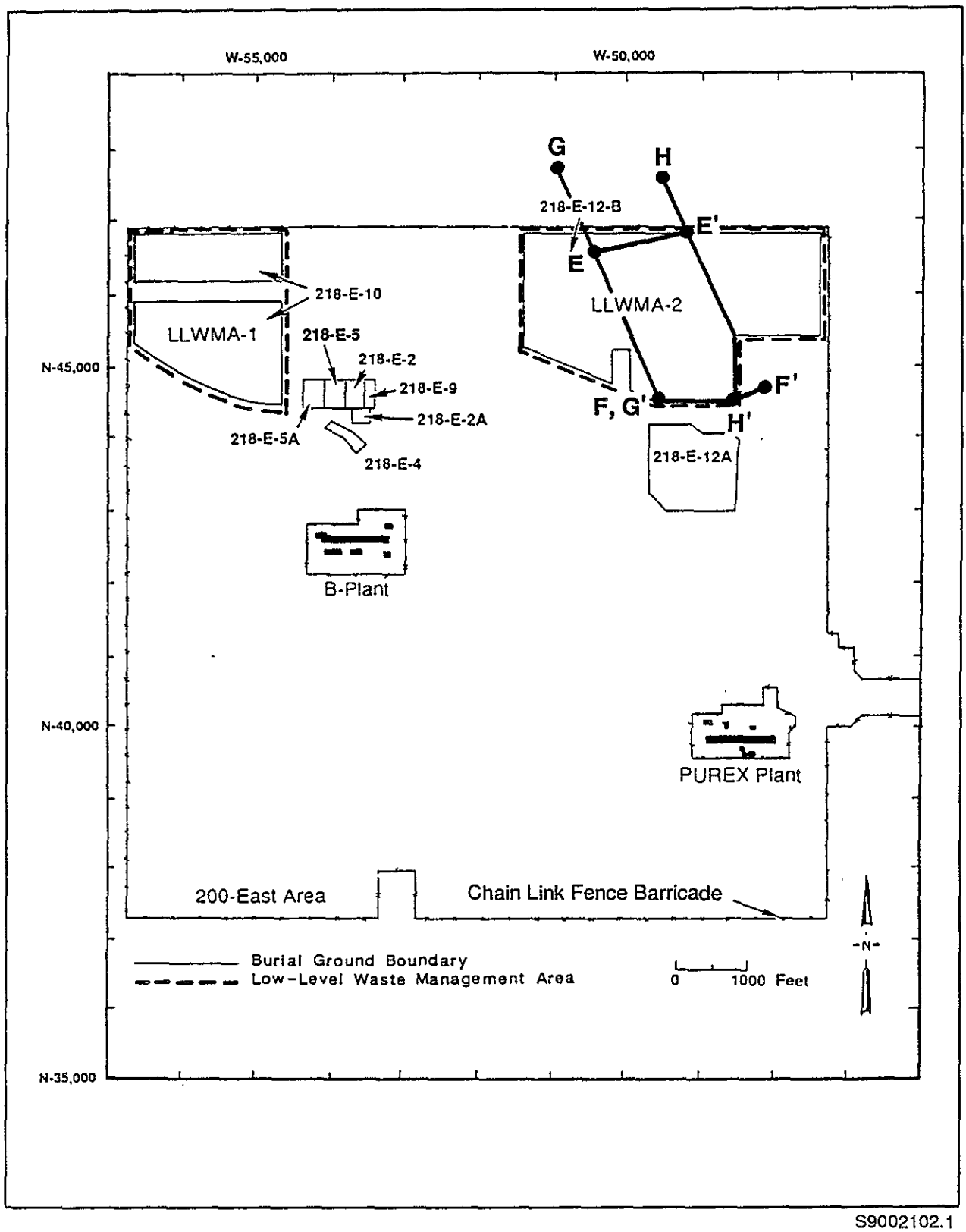

Figure 3-2. Location of Geologic Cross Sections Near Low-Level Waste Management Areas 1 and 2.

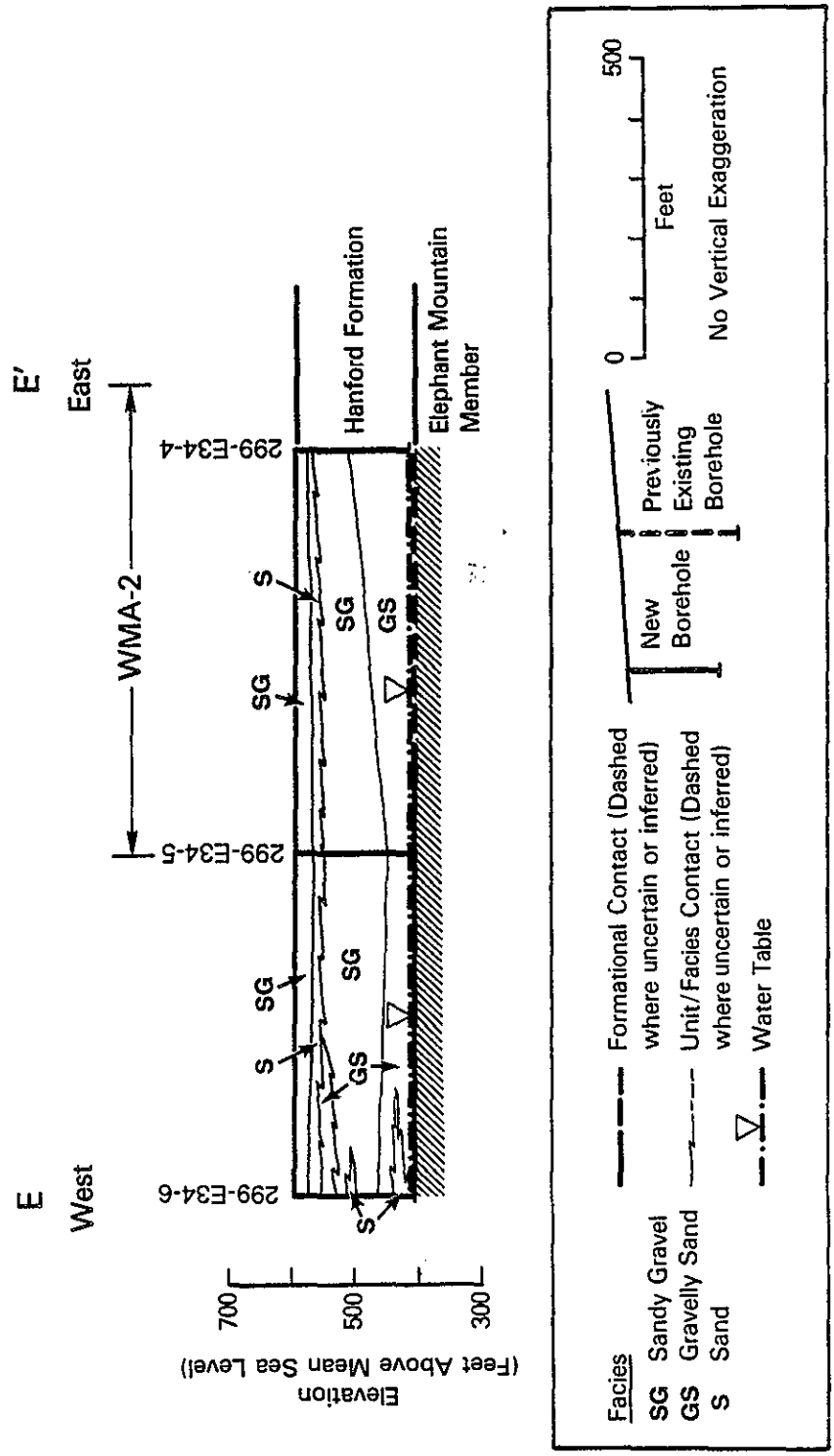

Figure 3-3. Geologic Cross Section E-E', Low-Level Waste Management Area 2 (Source: Last, et al. 1989, p. 5.18).

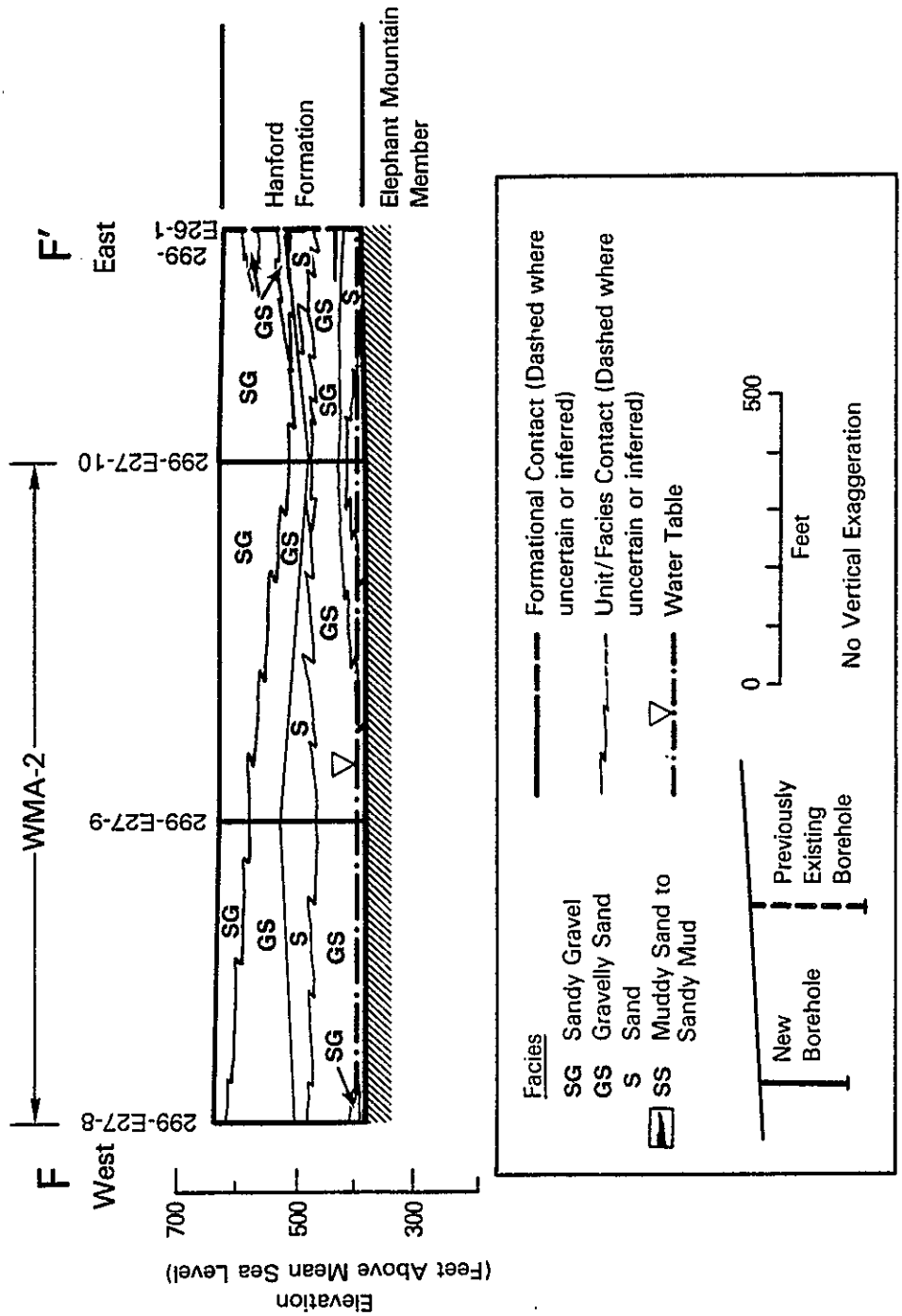

Figure 3-4. Geologic Cross Section F-F', Low-Level Waste Management Area 2 (Source: Last, et al. 1989, p. 5.19).

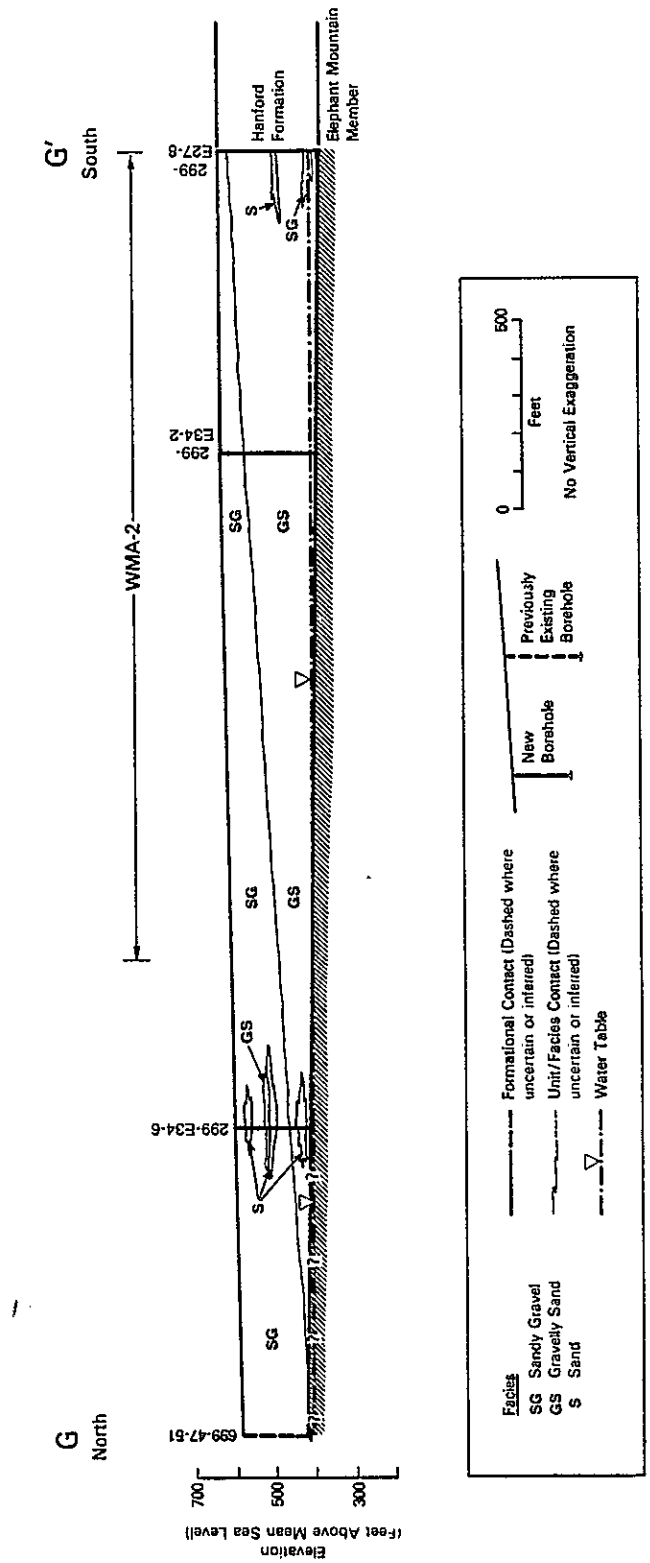

Figure 3-5. Geologic Cross Section G-G', Low-Level Waste Management Area 2 (Source: Last, et al. 1989, p. 5.20).

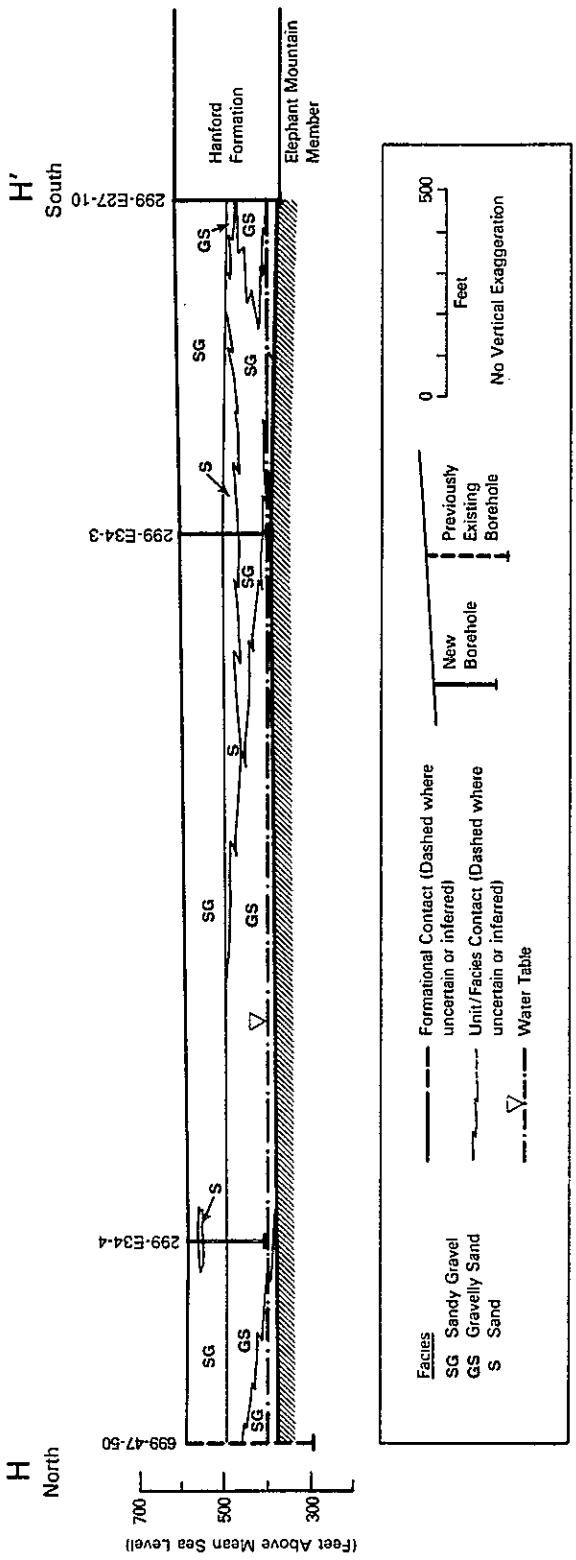

Figure 3-6. Geologic Cross Section H-H', Low-Level Waste Management Area 2 (Source: Last, et al. 1989, p. 5.21).

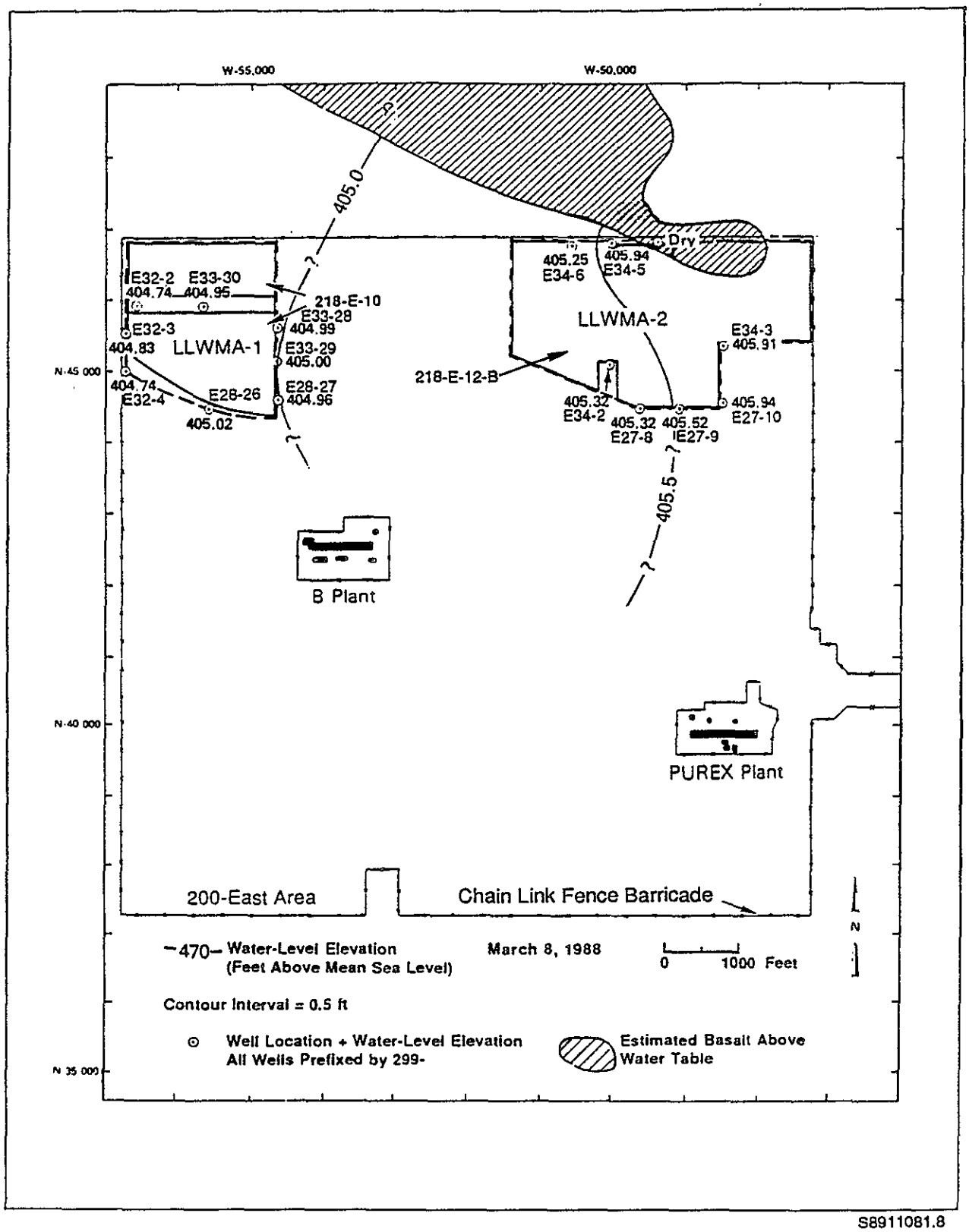

Figure 3-7. Water Table Beneath Low-Level Waste Management Areas 1 and 2 in the 200 East Area, June 29, 1988. (Source: DOE-RL 1989, p. 5-20)

The uppermost aquifer beneath 200 East Area is the unconfined Hanford formation. The flow direction of this aquifer at the 200 East Area is primarily from the west to the east and south-east toward the Columbia River with lesser amounts flowing to the north and northwest. As shown by the groundwater elevation contours in Figure 3-7, the flow direction at LLWMA-2 is to the west. The aquifer is recharged locally by precipitation and by discharges from active liquid waste disposal sites. The largest source of recharge is "B Pond," a man-made wastewater disposal site located approximately 1 mi southeast of LLWMA-2.

The major surface water feature at the Hanford Site is the Columbia River, which is located approximately 8 mi north and 8 mi east of the 200 East Area. In the Columbia Basin, the river is used extensively for irrigation as well as for production of electricity with hydroelectric dams. The river is also used as a source of drinking water by a number of municipalities, including the city of Richland, whose water intakes are approximately 2 mi downstream from the southern perimeter of the Hanford Site (20 mi southeast of the 200 East Area), and the cities of Kennewick and Pasco. The river, including the reach adjacent to the Hanford Site, is used for recreation such as boating, fishing, and swimming.

There are two discontinuous ephemeral streams crossing the Hanford Site, Cold Creek and Dry Creek. These streams cross the southwestern part of the Site and drain toward the Yakima River. At their closest point, these streams are approximately 4 mi southwest of the 200 East Area.

Other surface water features near the 200 East Area include West Lake, a natural lake located approximately 2 mi north of the 200 East Area and B Pond. The B Pond provides artificial recharge to the unconfined aquifer under the 200 Areas plateau.

3.2 TOPOGRAPHY AND LAND USE

The Pasco Basin forms the physiographic low of the larger Columbia Basin, with the Hanford Site located over the structural low of the Pasco Basin. The Hanford Site is bordered to the southwest, west, and north by large anticlinal ridges and to the northeast by the cliffs of the White Bluffs. Elevations range from approximately 345 ft above mean sea level (AMSL) in the southeastern portion of the Site to 3,586 ft AMSL at the summit of the Rattlesnake Hills southwest of the Site.

The topography of the 200 East Area is relatively flat. In general, the land surface slopes from the southwest to the northeast. Elevations range from approximately 720 ft AMSL at the southwest corner to approximately 580 ft AMSL in the northeast corner.

The topographic features at Trench 94 are shown on Plate A-1, Appendix A. The land surface at 218-E-12B Trench 94 slopes gently to the north at a grade of approximately 2 percent. The surface elevation at the south side of Trench 94 is approximately 600 ft AMSL. The surface elevation at the north side of the trench is approximately 595 ft AMSL. The elevation at the bottom

of the trench is approximately 545 ft AMSL. The spoil pile from excavation of Trench 94 begins approximately 200 ft northwest of the trench. The spoil pile is aligned east-west and is approximately 500 ft wide by 1,000 ft long. The spoil pile is approximately 25 ft high with a maximum elevation of 617 ft AMSL. Side slopes of the spoil pile are approximately 2:1 (horizontal: vertical).

Land use within the 200 East Area is for chemical separation processing and waste management activities. Land surrounding the 200 East Area is used for waste management activities or is unused. The 200 West Area, another processing and waste management area, is approximately 2.5 mi west of 200 East. The commercial low-level radioactive waste disposal facility operated by U.S. Ecology, Inc., is immediately to the southwest of the 200 East Area.

The 200 East Area is located within a controlled area of the Hanford Site. Public access is not allowed. The nearest point of public access is State Highway 240, which is approximately 4 mi to the south of the 200 East Area.

3.3 CLIMATE

The climate at the Hanford Site is characterized by low precipitation, generally mild temperatures, and occasional high winds. The average monthly temperatures for the period 1912 through 1980 range from a low of 29 °F in January to 76 °F in July. During winter, the highest monthly average temperature at the Hanford Meteorological Station, which is located between the 200 East and 200 West Areas, was 44 °F and the record lowest was 21 °F; both occurred during February. During summer, the highest maximum monthly average temperature was 82 °F in July and the record lowest was 63 °F in June. The average annual precipitation measured at the Hanford Meteorlogical Station is 6.3 in. Most of the precipitation occurs during the winter with nearly half the annual amount occurring during the months November through February. Days with greater than 0.5 in. precipitation occur less than 1 percent of the year. The highest average monthly relative humidity occurs during the winters, approximately 75 percent, and the lowest in the summer, approximately 35 percent (DOE 1987, p. 4.29).

Mean monthly wind speeds at the Hanford Meteorological Station range from a low of 6 to 7 mi/h in the winter months to a high of 9 to 10 mi/h in the summer (DOE 1987, p. 4.27). The wind rose for the 200 East Area indicates that predominate wind direction is from the northwest to west. This wind rose is included on Plate A-1, Appendix A.

3.4 UNIT DESCRIPTION

The current configuration of Trench 94 is shown in Plate A-2, Appendix A. The trench consists of a rectangular excavation approximately 50-ft deep. Surface dimensions of the trench are approximately 350 ft north-south by 400 ft east-west. The bottom dimensions of the trench are approximately

200 ft north-south by 330 ft east-west. Side slopes of the trench are approximately 3:2.

As additional SRC disposal area is needed, Trench 94 will be expanded to the west. The final surface dimensions will be approximately 1,800 ft east-west by 600 ft north-south. Final bottom dimensions will be approximately 1,650 ft east-west by 450 ft north-south.

A ramp leads from the corner of 12th Street and Canton Avenue to the bottom of the trench and provides access to the disposal area. This ramp slopes to the south and enters the trench at the northwest corner. The ramp is approximately 900 ft long and 40 ft wide with a uniform slope of 4.6 percent.

The SRCs are currently placed along the east side of Trench 94. At the far east edge of the trench there is one row of four SRCs, and to the west of this row are two rows of two SRCs each. Each SRC is supported by four concrete pedestals and takes up approximately 2,300 ft^2 of the trench area. A photograph of the SRCs and pedestals is provided as Appendix B.

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4.0 WASTES RECEIVED FOR DISPOSAL

4.1 GENERAL DESCRIPTION OF WASTES

Trench 94 is to be used for final disposal of SRCs from retired nuclear submarines. This disposal should continue for approximately the next 20 yr at the rate of approximately five to six SRCs per year.

Each SRC consists of a single section of the submarine, which contains the nuclear reactor plant, consisting of the reactor vessel, steam generators, piping, pumps, and valves. Figure 4-1 provides a general schematic of a typical SRC.

Prior to shipment to the Hanford Site, the SRC is removed from the retired submarine. The process for removal of the SRC from the submarine is described in the SRC disposal environmental impact statement (Navy 1984, pp. B-3 through B-9) and involves several steps, including the following:

- Removal of spent nuclear fuel from the reactor
- Removal of free liquids which can be pumped or drained and absorption of residual moisture using diatomaceous earth in a volume equal to two times the liquid volume (to reduce the potential for hydrogen generation from hydrolysis of residual water absorbed on diatomaceous earth, a hydrogen-oxygen recombiner is provided in the reactor compartment [DOE-RL 1989, p. 4-6])
- Cutting and sealing piping systems
- Cutting the SRC from the rest of the submarine
- Sealing the ends of the SRC with steel end plates
- Testing the SRC to verify that all penetrations and openings have been permanently closed and sealed.

Once prepared for shipment, the SRC consists of a completely sealed unit. Containment is provided by the outer hull of the submarine and the heavy shipyard-fabricated steel bulkheads that have been welded to the outer hull. The SRC has typical dimensions of approximately 33 ft outside diameter by 40-ft length and weighs approximately 1,000 tons.

4.2 DESCRIPTION OF PCB WASTES

The SRCs received at Trench 94 contain several materials with PCBs. The bulk of the PCBs are contained in sound-damping felt. Under an agreement with the Navy and Ecology, all PCB-containing sound-damping felt will be removed from the SRCs before disposal. In addition, the DOE-RL requires the Navy to certify PCB cleanup to agreed-upon limits. Work to remove the PCB-containing felt from the six SRCs already at Trench 94 that still have this material

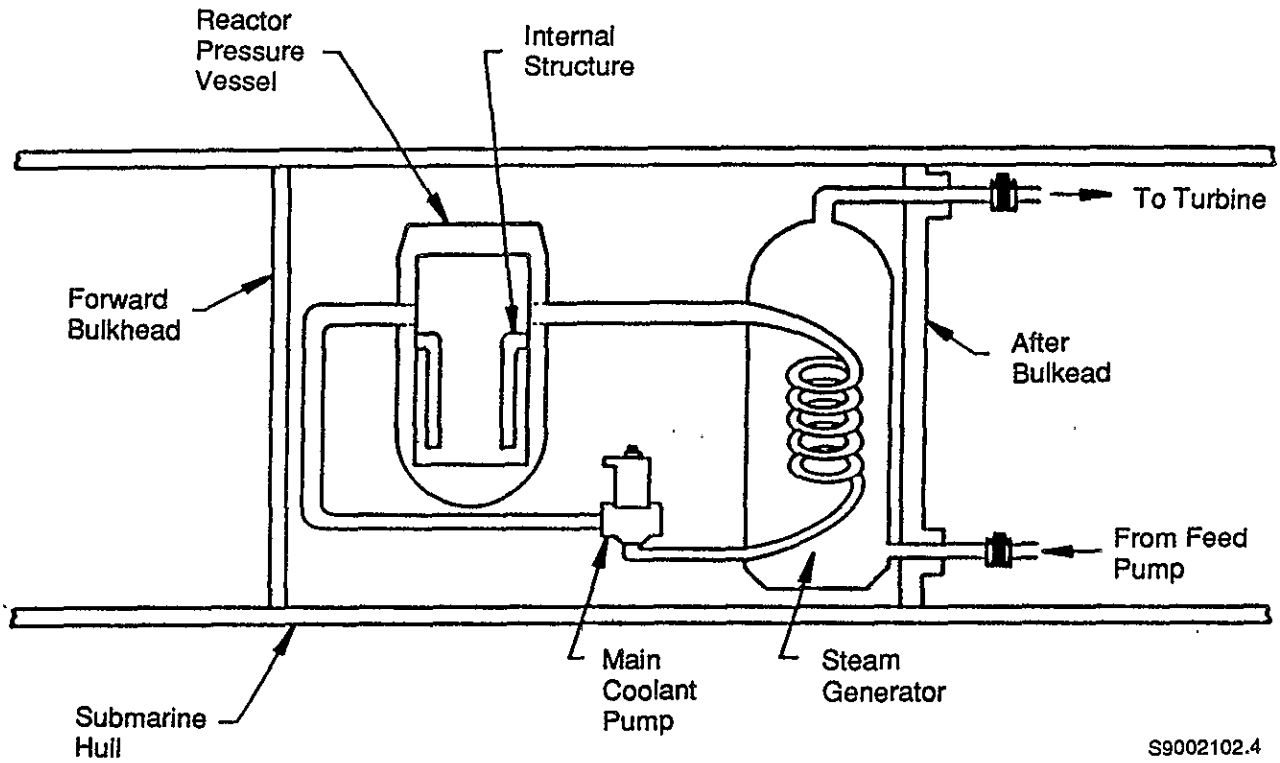

Figure 4-1. General Schematic of Submarine Reactor Compartment. (Source: Navy 1984, p. 2-3)

is scheduled to be completed by the Navy by mid-1990. As was the case for the last two SRCs shipped to Hanford in October 1989, felt will be removed from any additional SRCs before shipment to Hanford. The only PCBs that will remain in the SRCs at the time of disposal are small amounts of nonmetallic materials such as insulation, electrical cables, and some rubber items. The Navy has determined that removal of these items would result in significant occupational exposure to radiation and would be extremely difficult in any event.

The Navy investigated to determine if any of the materials that will remain in the SRCs at the time of burial are hazardous. The results of this investigation showed that some of the materials remaining in the SRCs contain PCBs as discussed above. These materials were analyzed for PCBs and concentrations were found to be as high as 5,870 ppm. (One exception was a small piece of double-backed adhesive tape holding a small sign in place which tested at 46,900 ppm. This was removed and no other similar tape was found.) Based on these results, the Navy reported that the total amount of PCBs that will remain in the SRCs at the time of disposal is less than three lb per SRC. The Navy reported that the PCBs are all contained in the formulation of solid compounds and that none of the PCBs can be removed by wipe survey cloths. The remaining PCB materials are considered to be PCB articles, as defined in 40 CFR 761.3. Disposal of these materials in a chemical waste landfill is allowable under 40 CFR 761.60(b)(5).

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5.0 OPERATION PLAN

Title 40 CFR 761.75(b)(8)(ii) requires that an operation plan for a chemical waste landfill be developed and submitted to the EPA Regional Administrator for approval. This plan shall include detailed explanations of the procedures to be used for recordkeeping, surface water handling procedures, excavation and backfilling, waste segregation, burial coordinates, vehicle and equipment movement, use of roadways, leachate collection systems, sampling and monitoring procedures, monitoring wells, environmental emergency contingency plans, and security measures to protect against vandalism and unauthorized waste placements. If the landfill is to be used to dispose of liquid wastes containing between 50 ppm and 500 ppm PCB, the operation plan must include additional procedures to determine that liquid PCBs to be disposed of at the landfill do not exceed 500 ppm PCB and to prevent the migration of PCBs from the landfill. The information contained in this chapter, along with referenced material from the LLBG Dangerous Waste Permit Application (DOE-RL 1989), constitutes an operation plan for Trench 94 for the disposal of SRCs containing solid PCB wastes for the 5-yr interim approval period. The following sections address the specific requirements for an operation plan under 40 CFR 761.75(b)(8)(ii).

Many of the requirements of an operation plan are met through compliance with similar or more stringent requirements for dangerous waste facilities under WAC 173-303. In such cases, compliance with WAC 173-303 will be used to demonstrate compliance with 40 CFR 761.75. A cross-reference of requirements under 40 CFR 761, WAC 173-303, and 40 CFR 264 is given in Appendix C.

5.1 RECORDKEEPING

The 218-E-12B burial ground must comply with dangerous waste facility recordkeeping requirements under WAC 173-303. Compliance with these requirements satisfies recordkeeping requirements for chemical waste landfills under 40 CFR 761.180(b), (d), (e). Compliance with specific requirements is discussed below.

5.1.1 Disposal and Storage Facilities [40 CFR 761.180(b)]

As required by 40 CFR 761.180(b)(2), each PCB disposal facility must prepare and maintain a written annual document log that includes the following:

- The facility name, address, and EPA identification number
- For each PCB article or PCB article container received for disposal:
  - The manifest number

- Name and address of the generator
- The serial number of the PCB article or the PCB article container number
- A description of the contents of the PCB article or container including total weight of PCB waste and date removed from service for disposal.

The above information is included in the LLBG operating records. A detailed description of LLBG recordkeeping is contained in Section 12.4.2 of the LLBG Dangerous Waste Permit Application (DOE-RL 1989, pp. 12-15 through 12-18). As required by WAC 173-303-380, the burial ground operating record includes the following (DOE-RL 1989, p. 12-16):

- Description and quantity of each dangerous waste received and the method(s) and date(s) of disposal at the burial ground
- Manifests identifying the generator of the wastes disposed of at the burial ground
- The location of each dangerous waste disposed of at the facility and the quantity at each disposal location
- Waste analysis results.

These records are maintained by Westinghouse Hanford Company Solid Waste Management (the organization responsible for operating the LLBG) and are maintained at the 2750E Building in the 200 East Area. As required under 40 CFR 761.180(b), records describing the SRCs disposed of at Trench 94 will be maintained for a minimum of 20 yr after closure.

Title 40 CFR 761.180(b)(3) requires the owner/operator of the facility to prepare and submit an annual report by July 15 of each year, beginning July 15, 1991. The annual report must contain the following:

- The name, address, and EPA identification number of the facility
- A list of the numbers of all signed manifests of PCB waste initiated or received by the facility during the year
- The total weight, in kilograms, of PCB waste (by waste category) received or disposed of during the year and remaining in storage for disposal at the end of the year.

Each year, the annual document log described in Section 5.1.1 will be used to prepare an annual report containing the above information. The annual report will be submitted to the EPA Regional Administrator by the DOE-RL.

5.1.2 Chemical Waste Landfill Facilities [40 CFR 761.180(d)]

Title 40 CFR 761.180(d) requires the owner/operator of a chemical waste landfill to maintain records of water analyses from monitoring and records of waste burial coordinates. These requirements are met through compliance with equivalent dangerous waste requirements under WAC 173-303, as discussed below.

Recordkeeping requirements for groundwater monitoring programs are given in WAC 173-303-645. Procedures for maintenance of groundwater monitoring records at the LLBG are described in detail in Section 12.4.2.2.7 of the LLBG Dangerous Waste Permit Application (DOE-RL 1989, pp. 12-17 through 12-18). Groundwater monitoring records are maintained at the 2750E Building and include groundwater quality data, records of groundwater flow rate and direction, and results of statistical analysis of monitoring data. As required by 40 CFR 761.180(d), these records related to 218-E-12B Trench 94 will be maintained for a minimum of 20 yr after closure.

The operating record for the burial ground includes the location of each radioactive dangerous waste container disposed of within the burial ground (DOE-RL 1989, p. 12-16). These records include the SRCs disposed of at Trench 94. The location data include disposal trench identification as well as the coordinates of burial (with reference to the Hanford Site grid). As required by 40 CFR 761180(d), these records will be maintained for a minimum of 20 yr after closure.

5.1.3 Retention of Special Records by Storage and Disposal Facilities [40 CFR 761.180(e)]

Title 40 CFR 761.180(e) requires PCB storage and disposal facility owner/operators to maintain all documents, correspondence, and data pertaining to disposal of PCBs, which are provided by or provided to any State or local government agency. The facility owner/operator must also maintain all applications for Federal, State, or local permits and related correspondence. The above records will be maintained by the Westinghouse Hanford Company Solid Waste Management organization at 2750E Building.

5.2 SURFACE WATER HANDLING

An engineered surface water handling system is not part of operations at Trench 94. The flat topography at the site, porous surface soils, and low rainfall combine to minimize run-on and run-off. Rainfall soaks into the sandy soil rather than flowing along the surface. Small pools of water on the surface can be observed after rapid snowmelt, but usually dissipate after 72 hours (DOE-RL 1989, p. 2-54). Because Trench 94 is entirely below grade, there is no potential for run-off from the trench. All precipitation falling within the trench infiltrates into the soil. During the period of interim approval, the SRCs will be supported above the ground surface so that the only water that will contact the SRC hull is rainfall that falls directly on the hull.

5.3 EXCAVATION AND BACKFILL

As discussed in Section 3.4, Trench 94 has currently been excavated to approximate surface dimensions of 350 ft by 400 ft and to a depth of approximately 50 ft. Additional excavation within the defined boundaries of Trench 94 (see Plate A-2, Appendix A) will take place as needed based on the number of SRCs received for disposal. Spoils from the excavation are collected near the trench and will eventually be used to backfill the trench. The current and planned extent of the trench and the location of the spoil area are shown on Plate A-2 in Appendix A.

During the 5-yr interim approval period there will be no backfilling of the trench. The SRCs in Trench 94 will remain uncovered to allow inspection to verify the hull integrity and to verify that there is no release of wastes to the environment.

5.4 WASTE SEGREGATION BURIAL COORDINATES

As discussed in Section 5.1, LLBG records kept at the 2750E Building by Solid Waste Management include the burial locations of all wastes (DOE-RL 1989, p. 12-16). These records include the location of each SRC placed in Trench 94.

5.5 VEHICLE AND EQUIPMENT MOVEMENT

Vehicle and equipment movement within Trench 94 is generally limited to waste receipt, which occurs only infrequently. The SRCs are transported to the Hanford Site by barge and received at the Port of Benton facilities near the 3000 Area. The SRCs are then transported to the 218-E-12B burial ground by tractor-trailer during off-peak traffic hours. The SRCs are transported into Trench 94 and unloaded onto concrete foundations. Hanford Site roads and estimated traffic volumes are shown in Figure 5-1.

5.6 USE OF ROADWAYS

As described in Section 5.5, vehicle and equipment movement at Trench 94 is very limited. SRCs are transported to Trench 94 by tractor-trailer using Hanford Site roadways. The only roadway at Trench 94 is the access ramp from the corner of 12th Street and Canton Avenue into the trench. This roadway is used for movement of SRCs into the trench. The location and profile of this roadway is shown in Plate A-2, Appendix A. As noted on Plate A-2, this roadway is constructed according to the Washington State Department of Transportation document M41-10, *1988 Standard Specifications for Road, Bridge, and Municipal Construction.*

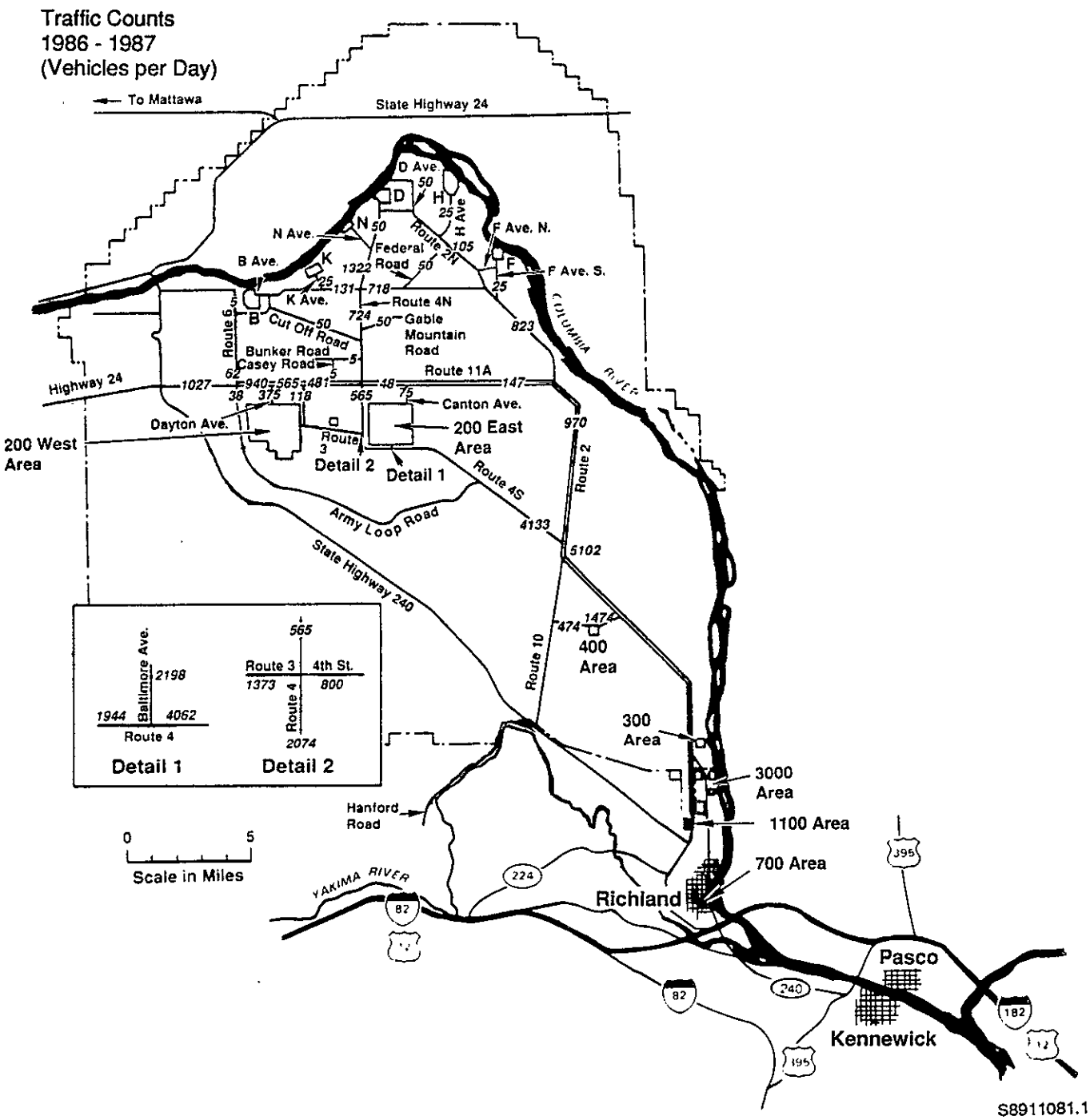

Figure 5-1. Hanford Site Roads and Estimated Traffic Volumes. (Source: Doe-RL 1989, p. 2-47)

5.7 LEACHATE COLLECTION SYSTEM

Trench 94 does not employ a leachate collection system. Generation of contaminated leachate is prevented by preventing contact of wastes with water. The PCB wastes are fully contained within the SRC hull and contact with rainwater or other potential sources of leachate is prevented (the SRC hulls are described in Section 4.1). As described in Section 6.0, because of the slow corrosion rate and high structural strength of the SRC hulls, they will remain intact for the 5-yr interim approval period. Operation of Trench 94 without a leachate collection system during this period will not pose an unreasonable risk to human health or the environment. Therefore, a waiver from leachate collection system requirements during the interim approval period is requested in Chapter 8.0.

5.8 SAMPLING AND MONITORING PROCEDURES

As discussed in Chapter 6.0, PCB wastes are fully contained within the SRC hulls. Because of the slow corrosion rate and high structural strength of the SRC hulls (see Chapter 6.0), the hulls will remain intact for the 5 yr interim approval period and release of PCBs to the environment will not occur. Under paragraph 9.c of the Memorandum of Agreement between the DOE-RL and EPA Region 10 concerning disposal of SRCs at Trench 94, groundwater monitoring requirements are waived for the interim approval period if the DOE-RL demonstrates that PCBs will not reach groundwater during this period. The information contained in this application for interim approval provides a demonstration that PCBs will not be released from the SRC hulls and will not reach groundwater during the interim approval period.

Although a waiver is requested for 40 CFR 761 groundwater monitoring requirements for Trench 94 during the interim approval period, a groundwater monitoring program is presently in place at the 218-E-12B burial ground as required by WAC 173-303-645. This monitoring program is described in Section 7.6.

5.9 MONITORING WELLS

As indicated in Section 5.8, a waiver is requested for 40 CFR 761 groundwater monitoring requirements during the interim approval period. Groundwater monitoring wells have already been installed at the 218-E-12B burial ground in response to dangerous waste groundwater monitoring requirements as described in Section 7.6.

5.10 ENVIRONMENTAL EMERGENCY CONTINGENCY PLAN

The burial ground must comply with contingency plan and emergency response requirements under WAC 173-303-350 and -360. The burial ground has an emergency plan and procedures in place that address response to fires, explosions, or unplanned sudden or gradual release of dangerous waste or dangerous waste constituents to air, soil, surface water, or groundwater.

The emergency plan and procedures are described in detail in Chapter 7.0 of the *LLBG Dangerous Waste Permit Application* (DOE-RL 1989, pp. 7-1 to 7-50). The plan identifies all personnel who have emergency responsibilities and specifies what these responsibilities are.

The plan also identifies specific procedures for emergency notifications, identification of hazardous/dangerous materials, hazard assessment, emergency control procedures, and responses to specific emergencies. Emergency notification procedures address both internal notifications (i.e., notifying staff that an emergency exists) and external notifications (i.e., notifying EPA and Ecology). Hazardous/dangerous materials identification procedures are those used to identify the wastes or constituents that have been released. Hazard assessment procedures are those used to determine the hazards associated with releases or other emergencies. Emergency control procedures include emergency incident identification and initial response, response to fires and explosions, response to spills or releases to the environment, and facility monitoring in the event of an emergency.

The plan also identifies, describes, and gives the location of emergency response equipment available to respond to emergencies at the burial ground. This equipment includes fire control equipment, spill response equipment, medical aid equipment, personnel protective equipment, and cleanup support equipment.

5.11 SECURITY MEASURES

The burial ground must comply with security requirements under WAC 173-303-310. Security requirements for the burial ground are met through use of a 24-hour surveillance system, a barrier, and warning signs. Additional detail regarding security is provided in Section 6.1 of the LLBG Dangerous Waste Permit Application (DOE-RL 1989, pp. 6-1 to 6-2).

The 218-E-12B burial ground is located within the 200 East Area and is, therefore, included within the continuous surveillance program for the Hanford Site. The Hanford Patrol security force maintains around-the-clock surveillance of the 200 East Area for the protection of government property, classified information, and special nuclear material. This surveillance will be maintained for the foreseeable future, including the interim approval period.

The 200 East Area is completely surrounded by security fencing, consisting of 8-ft-high chain link topped with three strands of barbed wire. Access into the 200 East Area is through a barricade, which is continuously manned with armed guards. Access is granted only to authorized personnel having DOE-issued security identification badges.

Active portions of the burial ground are posted with warning signs. These signs include the "DANGER-UNAUTHORIZED PERSONS KEEP OUT" signs required under WAC 173-303-310(2)(a), which are legible from a distance of at least 25 ft and visible from all angles of approach. In addition, because the SRCs

contain low-level radioactive wastes, the area immediately around the SRCs is posted with radiation warning signs. As described in the notes to Plate A-2, Appendix A, a temporary fence with steel posts and chain will be installed around the active portion of Trench 94 until all active work is completed and backfilled.

6.0 RISK FROM PROPOSED OPERATION

This chapter addresses the risk to human health and the environment from disposal of PCBs in Trench 94 during the interim approval period as described in the operation plan. A general discussion is given of how PCBs may be released from the site to pose a risk to human health and the environment. Factors that affect release of PCBs to the environment are identified. Practices and conditions at Trench 94, and their effect on preventing release of PCBs are then described. Finally, the risk due to release of PCBs from Trench 94 for the interim approval period is estimated.

6.1 POLYCHLORINATED BYPHENYL RELEASE MODES ASSOCIATED WITH SUBMARINE REACTOR COMPARTMENT DISPOSAL

The PCBs are a class of toxic chemicals that may pose a risk to human health or the environment if released to the environment. As described in Chapter 4.0, small amounts of PCBs are contained within the SRCs will be disposed of in Trench 94. These PCBs are contained within electrical cables, insulation, and some rubber items.

For the PCBs to be released to the environment, several things must occur. First, the PCBs must be transformed into a form that is mobile in the environment. As disposed, the PCBs are contained within solid matrices that are not mobile. Mobile[1] forms of PCB are as follows:

- In solution
- As a vapor
- As a suspendable particle.

To put PCBs into solution, it is necessary for the PCB waste matrix to come into contact with water. For PCBs in the SRCs, the most likely means of contact with water would be movement of rainwater into the SRC. To be in vapor form, the PCB waste must be in contact with air. To be suspended, the PCB waste must be in contact with the air and must be of small enough particle size (or erodible to small enough size) to be suspended. In addition, the wind speed must be great enough to suspend the particle.

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[1] "Mobile" is a relative term. PCBs, as a class of compounds, generally have very low mobility compared to other organic compounds. PCBs have very low solubility and very low vapor pressure, two properties associated with low mobility. For this discussion, "mobile forms of PCB" means that the PCBs are more mobile than they are in the waste matrices. It does not imply that they are highly mobile in the environment. The highly chlorinated PCBs typical of those found in the SCRs are in fact relatively immobile in the environment.

Once in a mobile form, a migration pathway must exist from the PCB waste source to potential receptors. For dissolved PCBs, this pathway would be either groundwater or surface water. As discussed in Section 7.3, there is no direct connection between Trench 94 and surface water. Groundwater would, therefore, be the pathway associated with migration of dissolved PCBs from Trench 94. For PCB vapors and PCB-contaminated particles, migration would occur via the air pathway.

For all of the above release modes, a breach in the SRC would be necessary. For dissolved transport, water must be able to move into the SRC, dissolve PCB from the waste, and move out of the SRC and into the ground. For vapor transport, PCB vapors must be able to move out of the SRC and into the atmosphere. Similarly, for particulate transport, air must be able to move into the SRC, suspend PCB-contaminated particles, and carry those particles out of the SRC into the atmosphere.

6.2 FACTORS AFFECTING RELEASE OF POLYCHLORINATED BIPHENYLS

The groundwater pathway (see Section 7.3) in the arid environment consists of a very small natural recharge from rainwater (6-10 cm/yr). The tendency of the soil to adsorb PCBs makes it highly unlikely that any PCBs could reach the unconfined aquifer below the site during the 5-yr interim approval period. The very low vapor pressures of the PCBs, their retention in solid matrices, and the absence of any near-term mechanism to reduce them to particulates all serve to inhibit any possibility of air pathway migration.

Moreover, as described above, all modes of PCB release from Trench 94 require a breach in the SRC. The most important factors affecting release of PCB from Trench 94, therefore, are those that would cause a breach in the SRC. Breaches in the SRC could be caused by corrosion of the SRC or mechanical failure of the SRC.

The primary factor affecting failure by corrosion is the corrosion rate of the SRC material. The Navy has evaluated the expected lifetime of SRCs following burial at the Hanford Site. This evaluation is presented in Appendix D. For the interim approval period, Trench 94 will not be backfilled and the SRCs will remain in the open air. As discussed in Appendix D, the National Association of Corrosion Engineers Reference Book lists corrosion rates determined from carbon steel calibration specimens at a variety of open air locations. A typical steel corrosion rate for rural arid environments (Phoenix, Arizona) is listed as 0.18 mil (0.00018 in.) per year. As explained in Appendix D, the minimum thickness of steel between any waste contained in an SRC and the environment is three-eighths of an inch (375 mil). The estimated time to corrode through this thickness of steel at 0.18 mil per year, therefore, is over 2,000 yr. In addition, the SRCs are covered with corrosion-resistant paint to further increase lifetime. In any event, the time needed to corrode through the outer SRC is very much greater than the interim approval period.

The primary factor affecting mechanical failure of the SRCs is their structural strength. The SRCs are constructed of steel at least three-eights inch thick and are of very high structural strength. The outer surfaces of the SRC include the outer submarine pressure hull, end bulkheads, and steel end plates. The pressure hull has very high strength, being designed for diving depths of over 400 ft (178 lb/in^2). The bulkheads sealing the ends of the pressure hull are designed for over 300 ft of submergence (133 lb/in^2). The SRC also meets the Nuclear Regulatory Commission requirements in 10 CFR 61.7 for a Type B container.

Because of the high strength of the SRCs, the chance of mechanical failure is extremely remote, particularly during the interim approval period when there will be no backfill. Accidental release of radioactive materials from the disposed SRCs was considered in the Environmental Impact Statement for disposal of the SRCs (Navy 1984, pp. 4-6 - 4-8). For example, a transportation accident which would cause breaching of the hull and/or bulkheads was considered and found to be highly unlikely and could occur only as the result of a hypothetical worst-case sequence of events with the most severe consequences (Navy 1984, p. 4-6).

6.3 PRACTICES TO MINIMIZE POTENTIAL FOR RELEASE OF POLYCHLORINATED BIPHENYLS

As indicated in the previous section, the high strength and slow corrosion rate of the SRCs minimizes the possibility of a breach and subsequent release of PCBs during the interim approval period. Several practices are employed at Trench 94 to further reduce the potential for breaching of the SRCs. During the interim approval period, Trench 94 will not be backfilled so that the SRCs will remain available for inspection. The SRCs will be inspected periodically to verify that they are in good condition. The inspection will also verify that a breach of the SRC has not occurred. If the inspections identify any problems such as surface corrosion, maintenance or corrective actions will be undertaken (e.g., removal of corrosion, painting). If a release from an SRC is observed, corrective actions will be identified and implemented.

6.4 RELEASE OF PCBs DURING THE INTERIM APPROVAL PERIOD

The previous sections describe the necessary conditions for release of PCBs from the SRCs and describe how the probability for such a release during the interim approval period is extremely low. As long as the SRC (i.e., pressure hull and end plates) remains intact during the interim approval period, no release of PCBs to the environment can occur. It is concluded that no release of PCBs to the environment will occur during the 5 yr interim approval period for the following reasons:

- The time required for the pressure hull and end bulkhead plating to corrode is estimated to be several hundred times longer than the interim approval period.

- During the 5-yr interim approval period the trench will not be backfilled with soil and there will be no external stress applied to the SRC package. The SRC package is constructed of steel and is of very high strength so that structural failure is very unlikely.

- The SRC packages will remain uncovered during the interim approval period so that any conditions which may lead to failure can be identified through inspection and corrected.

7.0 COMPLIANCE WITH 40 CFR 761.75

Requirements under TSCA for chemical waste landfills used to dispose of PCB wastes are contained in 40 CFR 761.75. Because Trench 94 is to be used to dispose of PCB wastes contained within SRCs, these requirements are applicable to Trench 94. These chemical waste landfill requirements address nine general areas: soils, synthetic membrane liners, hydrologic conditions, flood protection, topography, monitoring systems, leachate collection, chemical waste landfill operations, and supporting facilities. These requirements include a number of specific technical requirements, as well as general operating requirements. Compliance with these requirements is discussed in the following sections.

Because Trench 94 is also being used for disposal of dangerous wastes, it is subject to applicable requirements for dangerous waste landfills under WAC 173-303. In many cases, requirements for dangerous waste landfills are identical to or more stringent than the requirements for chemical waste landfills under TSCA. In such cases, compliance with 40 CFR 761.75 requirements will be satisfied through compliance with WAC 173-303 requirements. Appendix C presents a comparison of requirements under 40 CFR 761 and WAC 173-303.

7.1 SOILS

Title 40 CFR 761.75(b)(1) requires that chemical waste landfill sites be located in thick, relatively impermeable formations such as large-area clay pans. Where this is not possible, the soil underlying the site must have a high clay and silt content with the following parameters:

- In-place soil thickness of 4 ft or compacted soil liner thickness of 3 ft
- Permeability equal to or less than 1×10^{-7} cm/sec
- Greater than 30 percent by weight soil passing through a No. 200 Sieve
- Liquid Limit greater than 30
- Plasticity Index greater than 15.

The soils underlying LLWMA-2 where Trench 94 is located are described in Section 3.1. These soils are gravelly sands, sands, and sandy gravels and do not meet the above parameters which are associated with silts and clays. Soils at Trench 94 are generally of very high permeability, large grain size, and low plasticity.

7.2 SYNTHETIC MEMBRANE LINERS

For sites which are not underlain with soils meeting the requirements given above, 40 CFR 761.75(b)(2) requires that the chemical waste landfill have a synthetic membrane liner. The liner must provide at least a permeability equivalent to the soils described above (i.e., equal to or less than 1×10^{-7} cm/sec). Whenever a synthetic liner is used at a landfill site, special precautions must be taken to insure that its integrity is maintained and that it is chemically compatible with PCBs. Adequate soil underlining and soil cover must be provided to prevent excessive stress on the liner and to prevent rupture of the liner. The liner must have a minimum thickness of 30 mils.

Because soils at Trench 94 do not meet the requirements given in Section 7.1, a synthetic liner is required. Trench 94 does not have a synthetic liner, however, and the DOE-RL is requesting a waiver from this requirement for the interim approval period. The purpose of the synthetic liner is to prevent the migration of contaminants out of the landfill by containing leachate so that it can be collected. As described in earlier sections, the SRC hulls will prevent the generation of contaminated leachate by fully containing the PCB wastes and preventing contact with any potential sources of leachate (e.g., rainwater). As long as the SRC hull remains intact, generation of contaminated leachate will be prevented and there will be no migration of PCBs out of the landfill. As described in Chapter 6.0, the SRC hulls will remain intact for much longer than the interim approval period.

7.3 HYDROLOGIC CONDITIONS

Title 40 CFR 761.75(b)(3) specifies certain requirements related to the hydrologic conditions at the landfill site. The bottom of the landfill liner system or natural in-place soil barrier must be at least 50 ft above the historical high groundwater table. Location of the landfill in floodplains, shorelands, and groundwater recharge areas must be avoided. In addition, there must be no hydraulic connection between the site and standing or flowing surface water. Also, the site must have monitoring wells and leachate collection.

The location of Trench 94 satisfies the requirement for depth to water table. As discussed in Section 3.1, the water table elevation at Trench 94 is approximately 406 ft AMSL. As indicated in Section 3.2, the elevation of the bottom of Trench 94 is approximately 545 ft AMSL. The depth from the bottom of the trench to the water table, therefore, is approximately 139 ft.

Siting standards for dangerous waste facilities are given in WAC 173-303-420 and are applicable to Trench 94. These standards address location of dangerous waste facilities in floodplains, in areas under the jurisdiction of the Shoreline Management Act (i.e., wetlands and shorelines), and above sole source aquifers. These requirements are similar to the TSCA requirements for avoiding location in floodplains, shorelines, and recharge areas.

Trench 94 is not located in a floodplain. The site location is well beyond the boundaries of the 100-yr floodplain of the Columbia River, Yakima River, and Cold Creek and Dry Creek. Floodplains for these streams are shown in Figures 7-1 through 7-3, respectively.

The location of Trench 94 is not within "shorelines of the state" or "wetlands" as defined by the Shoreline Management Act of 1971 [Revised Code of Washington (RCW) 90.58.030(2)]. The nearest "shoreline of state-wide significance" is the Columbia River, which is at least 8 mi from the trench [RCW 90.58.030(2)(e)(v)(B)].

The location of Trench 94 complies with the WAC 173-303-420(6) requirement that dangerous waste facilities not be located above sole source aquifers. It is unclear whether this requirement, which is intended to protect drinking water sources, is equivalent to the TSCA requirement for avoiding location of landfills in groundwater recharge areas. Trench 94 is located in an area of low recharge. Natural recharge rates at the Hanford Site depend on soil and vegetation characteristics and may vary from less than 0.1 cm/yr to 10 cm/yr. Last et al. (1989, p. 6.2) estimated the natural recharge rate at active burial grounds to be on the order of 6 to 10 cm/yr. Artificial recharge occurs at the Hanford Site at liquid waste disposal facilities. No artificial recharge occurs at Trench 94. The major source of artificial recharge near the 200 East Area is B Pond, which is approximately 1 mile southeast of Trench 94. Artificial recharge at B Pond does not affect the hydrologic conditions at Trench 94.

There is no direct hydraulic connection between Trench 94 and standing and flowing surface water. Locations of surface water bodies are discussed previously in Section 3.1. The nearest standing water body is West Lake, which is approximately 2.5 mi north-northwest of Trench 94. The nearest stream is the Columbia River, located approximately 8 mi north of Trench 94 at its closest point. The nearest ephemeral stream is Cold Creek, which is approximately 5 mi southwest of Trench 94 at its closest point. As discussed in Section 5.2, there is no surface water run-off at Trench 94 and, therefore, no overland flow connection between Trench 94 and any surface waters.

There is a potential connection between Trench 94 and the Columbia River via the groundwater pathway. Recharge at Trench 94, if it occurs, could reach the unconfined aquifer beneath the site. The unconfined aquifer flows to the north and west toward discharge areas along the Columbia River (Last et al. 1989, pp. 3.27-3.28). Recharge at Trench 94 could, therefore, eventually reach the Columbia River.

Although a hydraulic connection does exist, the time frame associated with this connection is significantly greater than the interim approval period. The LLBG Dangerous Waste Permit Application (DOE-RL 1989, p. 5-65) presented a vadose zone time of travel of 100 yr for a vadose zone thickness of 210 ft and a recharge rate of 5 cm/yr. Adjusting this travel time for the vadose zone thickness of 139 ft from the bottom of Trench 94 to the water table yields a vadose zone travel time of 66 yr.

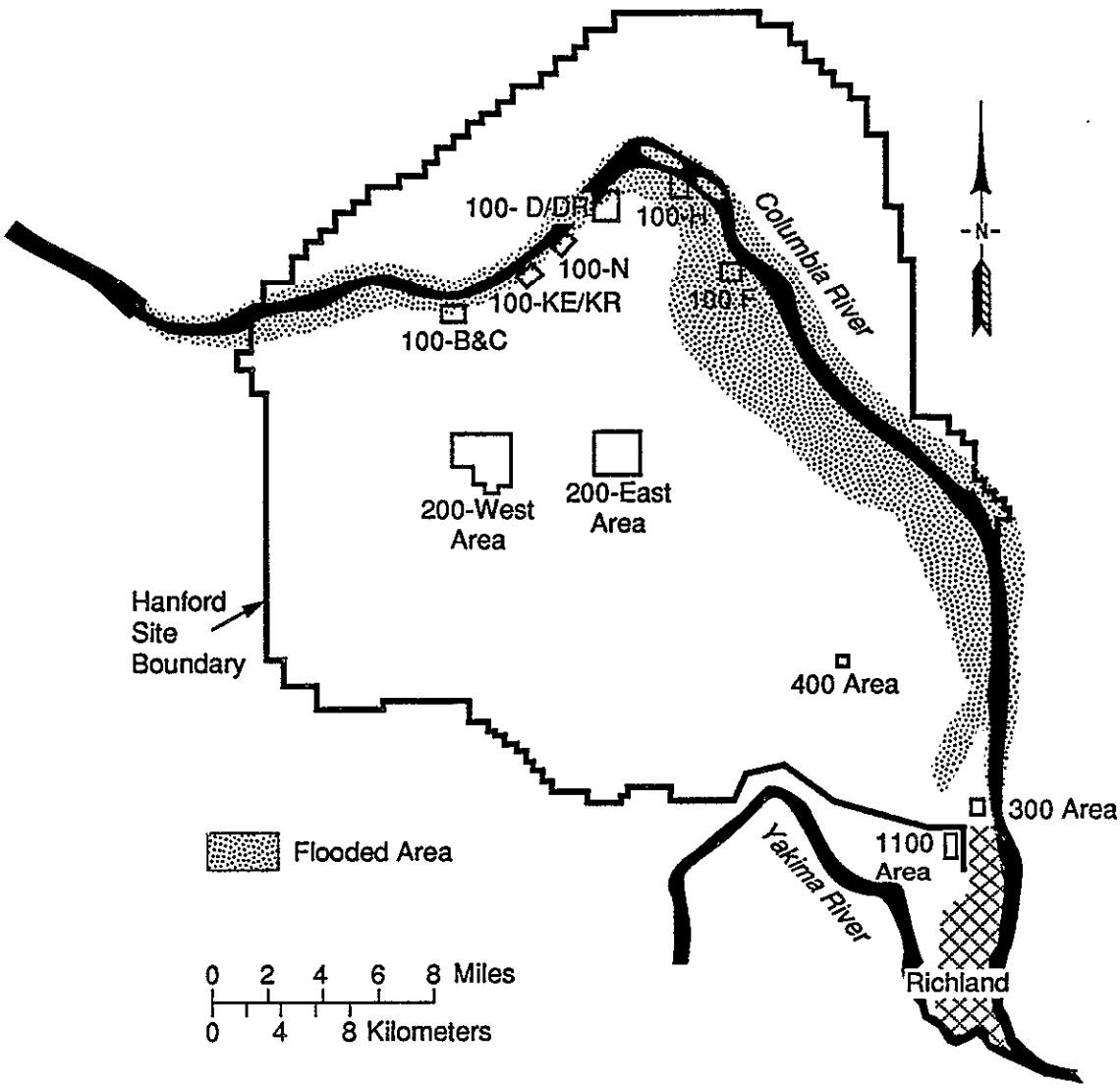

Figure 7-1. Columbia River Floodplain Boundary. (Source: DOE-RL 1989, p. 2-43)

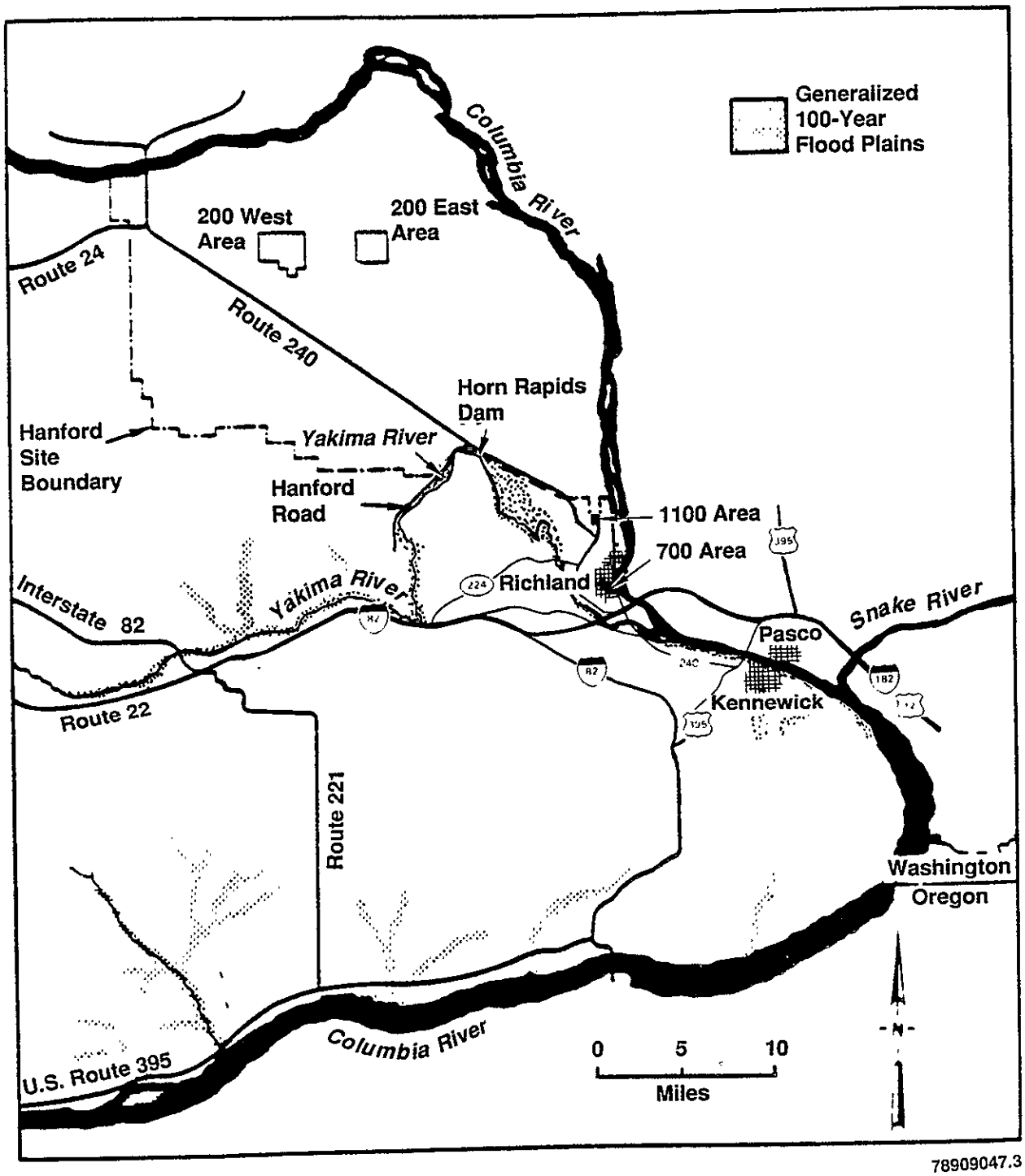

Figure 7-2. Yakima River Floodplain Boundary.
(Source: DOE-RL 1989, p. 2-44)

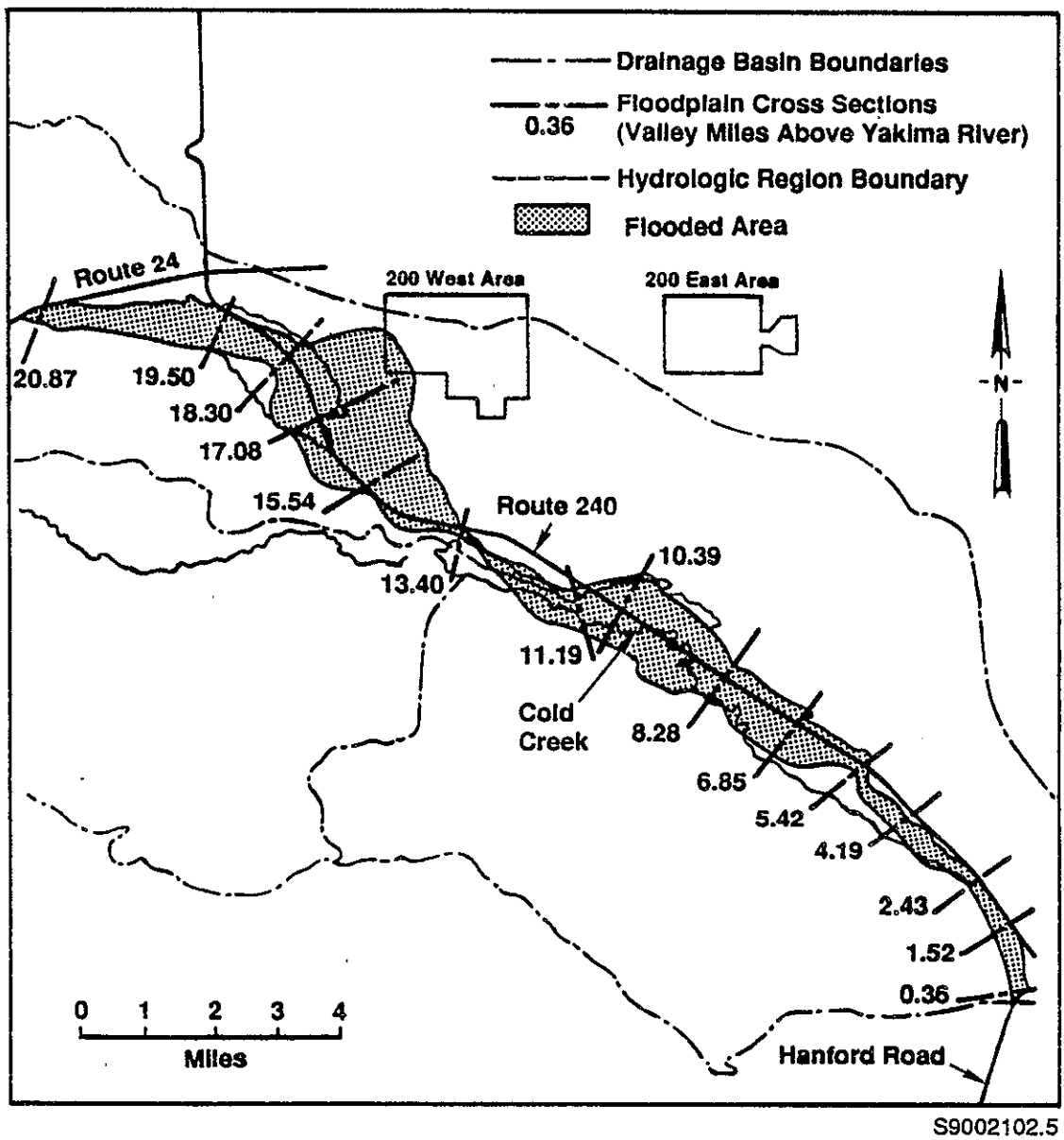

Figure 7-3. Cold Creek Floodplain Boundary.
(Source: DOE-RL 1989, p. 2-45)

As indicated in Sections 5.7 and 5.9, respectively, waivers are being requested for leachate collection system and groundwater monitoring requirements.

7.4 FLOOD PROTECTION

Title 40 CFR 761.75(b)(4) establishes flood protection requirements for chemical waste landfills. If the landfill site is below the 100-yr floodwater elevation, the operator must provide surface water diversion dikes around the perimeter of the landfill site with a minimum height equal to 2 ft above the 100-yr floodwater elevation. If the landfill site is above the 100-yr floodwater elevation, the operator must provide diversion structures capable of diverting all of the surface water run-off from a 24-hour, 25-yr storm. As indicated in Section 7.3, Trench 94 is not located in a 100-yr floodplain. Therefore, Trench 94 must have diversion structures capable of diverting run-off from a 24-hour, 25-yr storm. As discussed in Section 5.2, however, because Trench 94 is located below grade, and because of the porous soils and low precipitation at the site, there is no run-off from Trench 94. A diversion structure, therefore, is not required.

7.5 TOPOGRAPHY

Title 40 CFR 761.75(b)(5) requires chemical waste landfill sites to be located in an area of low to moderate relief to minimize erosion and to help prevent landslides or slumping. As discussed in Section 3.2, Trench 94 is located in an area of low relief. The land surface in the vicinity of Trench 94 slopes to the north at a grade of approximately 2 percent. Because of this relatively flat slope and the permeable surface soils, most precipitation seeps directly into the soil without visible run-off. The potential for erosion, therefore, is minimal.

Surface slopes are also flat enough to prevent landslides and slumping. The steepest slopes (i.e., those with the greatest potential for sliding or slumping) are the Trench 94 sidewalls and the spoil pile. Under WAC 173-303-283(3)(g), the LLBG must be operated such that there are no unstable hillsides or soils as a result of trenches. The Trench 94 sidewalls are excavated at a slope of 3:2 (horizontal:vertical), which is a stable slope for the surface sediments at the site. The slope of the spoil pile is approximately 2:1, which is also stable. There is no visible evidence of sloughing or slumping on either the trench wall or spoil pile.

7.6 MONITORING SYSTEMS

Title 40 CFR 761.75(b)(6) establishes technical requirements for monitoring systems. These requirements include those for water sampling [40 CFR 761.75(b)(6)(i)], groundwater monitor wells [40 CFR 761.75(b)(6)(ii)], and water analysis [40 CFR 761.75(b)(6)(iii)]. A groundwater monitoring program has been established at the burial ground as required for dangerous waste landfills. This program, and its compliance with TSCA requirements, is

described in the following paragraphs. As noted in Sections 5.8 and 5.9, however, a waiver is requested for groundwater monitoring requirements for Trench 94 during the interim approval period.

Under the water sampling requirements, at all sites receiving PCBs the ground and surface water from the disposal site area must be sampled to establish baseline quality prior to commencing operations under an approval. Groundwater in the area of Trench 94 has been sampled as part of the general groundwater monitoring requirements under WAC 173-303-645(8). Under these requirements, the facility owner or operator is required to install a monitoring system that is sufficiently broad to yield samples that represent the quality of background water that has not been affected by leakage from a regulated unit. A program of sampling and analysis to determine background groundwater quality is currently underway at the burial ground. This program is described in the LLBG Dangerous Waste Permit Application (DOE-RL 1989, pp. 5-77 through 5-147).

The water sampling requirements also specify that any surface watercourse designated by the EPA Regional Administrator must be sampled at least monthly when the landfill is being used for disposal operations and at a frequency of no less than once every six months after final closure of the disposal area. As described in Section 3.1, there are no natural surface water bodies in the disposal site area. The only surface water bodies in or near the 200 East Area are liquid waste management facilities (i.e., B Pond and its associated trenches). As discussed in Section 7.3, no natural or man-made surface water bodies are impacted by Trench 94 disposal operations because there is no run-off from the trench. Surface water sampling associated with Trench 94 operations, therefore, is not performed. Sampling of the liquid waste facilities in the 200 East Area does occur, but is not related to Trench 94 operations.

Several requirements exist for groundwater monitor wells at chemical waste landfills. Under 40 CFR 761.75(b)(6)(ii)(A), if underlying earth materials are homogeneous, impermeable, and uniformly sloping in one direction, only three sampling points shall be necessary. These three points must be equally spaced on a line through the center of the disposal area and extending from the area of highest water table elevation to the area of lowest water table elevation on the property. As described in Section 3.1, underlying earth materials are not homogeneous, impermeable, or uniformly sloping in one direction. More than three sampling points are, therefore, needed to comply with monitoring well requirements. At present, there are 11 groundwater monitoring wells around the perimeter of the 218-E-12B burial ground, as shown in Figure 7-4. These wells have been installed as part of the groundwater monitoring program required under WAC 173-303-645 and consist of eight downgradient shallow wells (E27-8, E27-9, E27-11, E34-2, E34-4, E34-5, E34-6, and E35-1) and three upgradient shallow wells (E27-10, E34-3, and E34-7).

Title 40 CFR 761.75(b)(6)(ii)(B) requires that all monitor wells be cased and the annular space between the monitor zone (zone of saturation) and the surface shall be completely backfilled with Portland cement or an equivalent material and plugged with Portland cement to effectively prevent

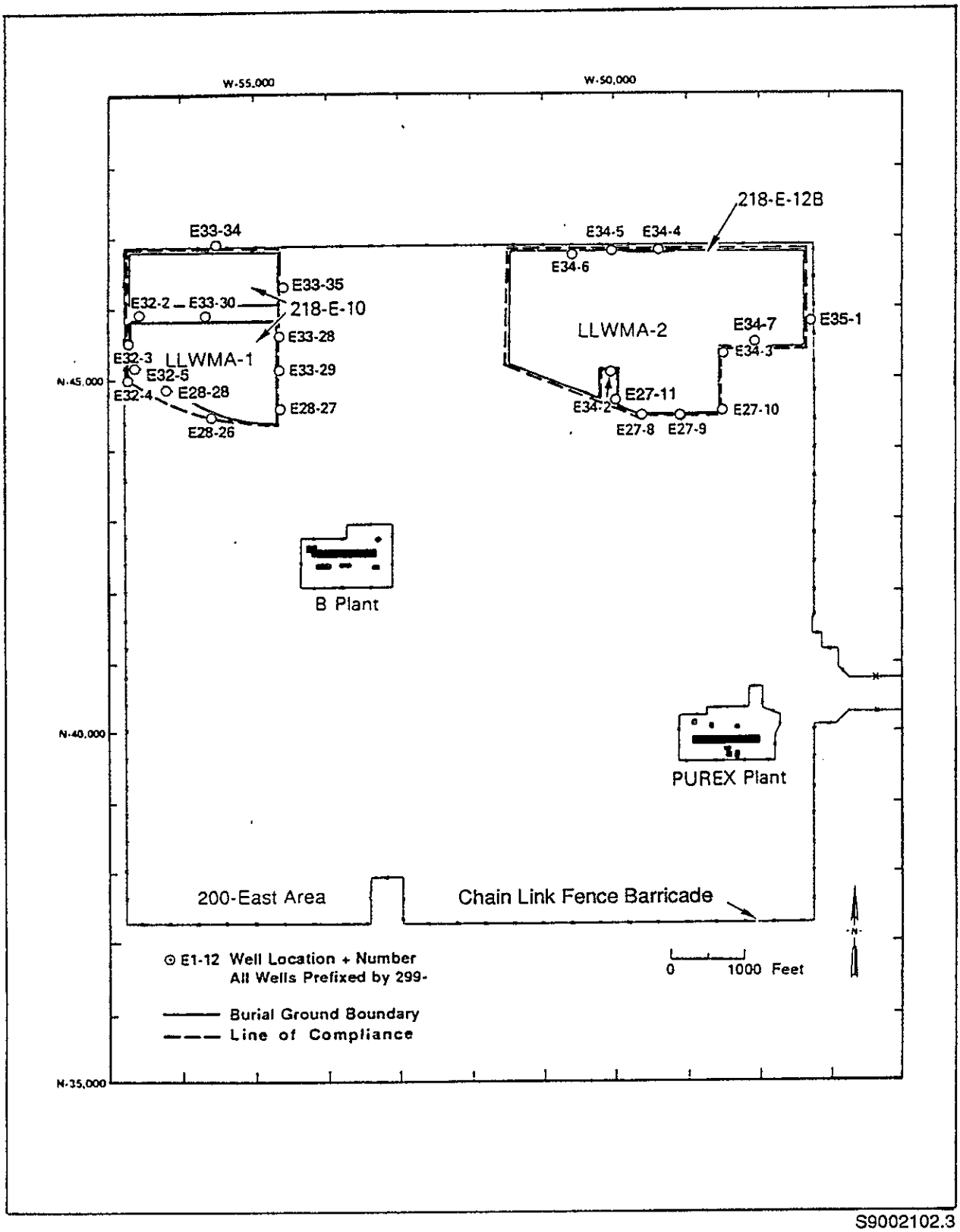

Figure 7-4. Monitor Well Locations at 200 East Area Low-Level Burial Grounds. (Source: DOE-RL 1989, p. 5-11)

percolation of surface water into the well bore. The well opening at the surface must have a removable cap to provide access and to prevent entrance of rainfall or stormwater run-off. The well must be pumped to remove the volume of liquid initially contained in the well before obtaining a sample for analysis. The discharge must be treated to meet applicable State or Federal discharge standards or recycled to the chemical waste landfill. Burial ground groundwater monitor wells meet these requirements. The annular space immediately above the sandpack is sealed with 5 ft of bentonite pellets. The remaining annular space is sealed with bentonite grout. Each well has a concrete pad at the ground surface and locking well cap. Well construction details are shown in Figure 7-5. Water removed from the wells during sampling is stored in temporary on-site tanks and then transferred to a treatment facility.

Water analysis requirements under 40 CFR 761.75(b)(6)(iii) specify analysis of groundwater and surface water samples for the following parameters: PCBs, pH, specific conductance, and chlorinated organics. Groundwater samples are analyzed in the field for pH and specific conductance. Laboratory analysis includes volatile and semivolatile organics, which includes the general categories of PCBs and chlorinated organics. Title 40 CFR 761.75(b)(6)(iii) requires that analytical procedures comply with those specified in 40 CFR 136. Analytical procedures for burial ground groundwater samples are those given in SW-846 (EPA 1986), which are equivalent to those in 40 CFR 136. Title 40 CFR 761.75(b)(6)(iii) also requires that monitoring data and records be maintained as required in 40 CFR 761.180(d)(1). As discussed in Section 5.1, recordkeeping at the burial ground complies with these requirements.

7.7 LEACHATE COLLECTION

Title 40 CFR 761.75(b)(7) establishes technical requirements for leachate collection systems for chemical waste landfills. A leachate collection monitoring system must be installed and monitored monthly for quantity and physicochemical characteristics of leachate produced. The leachate should be either treated to acceptable limits for discharge in accordance with a State or Federal permit or disposed of by another State or Federally approved method. As discussed in Section 5.7, a waiver is being requested from leachate collection system requirements for the interim approval period.

7.8 WASTE AND CONTAINER MANAGEMENT

Title 40 CFR 761.75(b)(8)(i) establishes technical requirements for chemical waste landfill operations for management of wastes and containers. PCBs and PCB Items must be placed in a landfill in a manner that will prevent damage to containers or articles. Other wastes placed in the landfill that are not chemically compatible with PCBs and PCB Items including organic solvents must be segregated from the PCBs throughout the waste handling process. This requirement is similar to dangerous waste container handling requirements under WAC 173-303-630 with which the burial ground must also comply. Management of the SRCs in Trench 94 complies with these requirements.

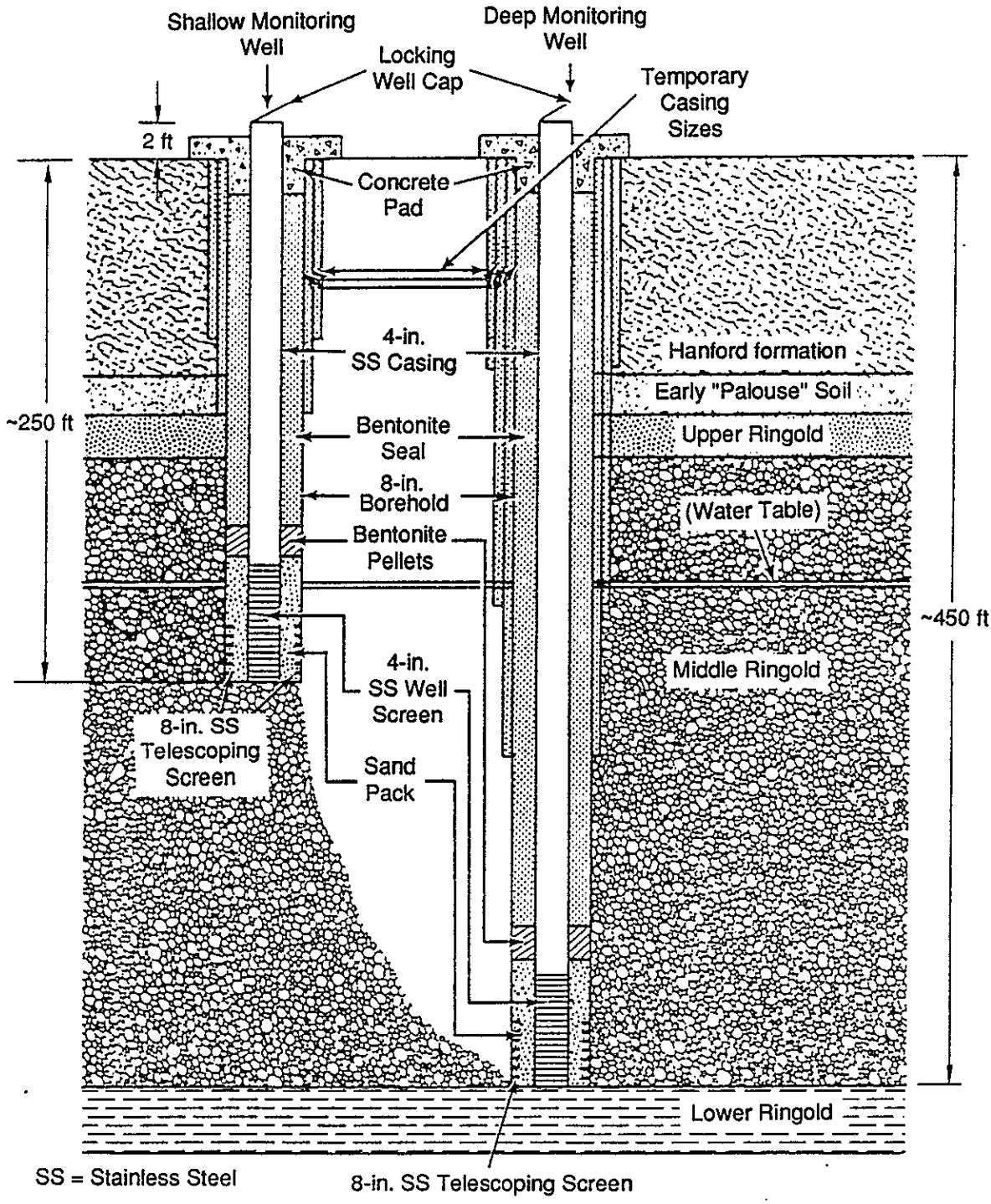

Figure 7-5. Monitor Well Construction Details.
(Source: DOE-RL 1989. p. 5-8)

The SRCs are placed in the trench in a manner that will not damage the PCB wastes. No other wastes are placed in Trench 94.

7.9 OPERATION PLAN

Title 40 CFR 761.75(b)(8)(ii) requires that an operation plan be developed and submitted to the EPA Regional Administrator for approval. This plan shall include detailed explanations of the procedures to be used for recordkeeping, surface water handling procedures, excavation and backfilling, waste segregation, burial coordinates, vehicle and equipment movement, use of roadways, leachate collection systems, sampling and monitoring procedures, monitoring wells, environmental emergency contingency plans, and security measures to protect against vandalism and unauthorized waste placements. If the facility is to be used to dispose of liquid wastes containing between 50 ppm and 500 ppm PCB, the operation plan must include additional procedures to determine that liquid PCBs to be disposed of at the landfill do not exceed 500 ppm PCB and to prevent the migration of PCBs from the landfill. The information contained in Chapter 5.0 is submitted in fulfillment of the requirements for an operation plan. As no liquid PCB wastes are received at Trench 94, requirements related to disposal of liquid PCB wastes are not addressed.

7.10 IGNITABLE WASTE

Title 40 CFR 761.75(b)(8)(iii) contains requirements that ignitable wastes not be disposed of in chemical waste landfills. Liquid ignitable wastes are wastes that have a flash point less than 60 °C (140 °F). Liquids and ignitable wastes are not placed into Trench 94.

7.11 BURIAL RECORDS

Title 40 CFR 761.75(b)(8)(iv) requires that records be maintained for all PCB disposal operations and include information on the PCB concentration in liquid wastes and the three dimensional burial coordinates for PCBs and PCB Items. Additional records must be developed and maintained as required in 40 CFR 761.180. Compliance with these recordkeeping requirements is discussed in Section 5.1.

7.12 SUPPORTING FACILITIES

Title 40 CFR 761.75(b)(9) establishes technical requirements for supporting facilities. These requirements include those for security fencing, roadways, and operations to prevent spilled liquids and windblown materials.

Title 40 CFR 761.75(b)(9)(i) requires that a 6-ft woven mesh fence, wall, or similar device be placed around the site to prevent unauthorized persons and animals from entering. This requirement is similar to the dangerous waste facility security requirements under WAC 173-303-310. As

discussed in Section 5.11, the burial ground is within the 200 East Area of the Hanford Site which is completely surrounded by security fencing. The only openings in the this security fencing are barricaded and manned by armed guards on a 24-hour basis. The security fences are 8-ft high chain link and are topped with three strands of barbed wire.

Title 40 CFR 761.75(b)(9)(ii) requires that roads be maintained to and within the site which are adequate to support the operation and maintenance of the site without causing safety or nuisance problems or hazard conditions. Currently, no load-bearing capacities of the Hanford roads are available; however, loads as large as 140 lb/in^2 have been transported without observable damage to road surfaces. All roads, including those providing access to Trench 94, meet the requirements of the American Association of State Highway and Transportation Officials HS-20-44 load rating. An HS-20-44 loading represents a two-axle tractor (front axle loading of 8,000 lb and rear axle loading of 32,000 lb) plus a single-axle trailer with a 32,000 lb axle loading.

Title 40 CFR 761.75(b)(9)(iii) requires that chemical waste landfills be operated and maintained in a manner to prevent safety problems or hazardous conditions resulting from spilled liquids and windblown materials. No liquid wastes or other liquids are placed in Trench 94. All wastes in Trench 94 are contained in the sealed SRCs and cannot be blown by the wind.

7.13 ADDITIONAL WAC 173-303 REQUIREMENTS WHICH INCREASE ENVIRONMENTAL PROTECTION

As a dangerous waste landfill, Trench 94 must be operated in compliance with all applicable requirements under WAC 173-303. These requirements include those that do not have equivalent requirements under 40 CFR 761. The additional requirements under WAC 173-303 increase the environmental protection associated with operation of Trench 94 for the disposal of SRCs. These requirements, which include those for inspections, training, and closure/post closure, are discussed in the following sections.

7.13.1 Inspections

In accordance with WAC 173-303-320, inspections of Trench 94 are conducted weekly. The burial ground trenches are inspected for run-on, run-off and erosion problems after significant precipitation or windstorms. Inspections are documented, and records are maintained for a minimum of 3 yr from the inspection date (DOE-RL 1989, pp. 6-2 - 6-4, 12-3, 12-16). Trench 94 will not be backfilled during the interim approval period so that the condition of the SRCs can be assessed through inspection to verify that no release of PCBs has occurred.

7.13.2 Training

In accordance with WAC 173-303-330, all personnel associated with dangerous waste operations receive training adequate to ensure that they perform their dangerous waste duties in a way that ensures facility compliance with environmental and worker safety regulations(DOE-RL 1989, pp 8-1 through 8-18).

7.13.3 Closure/Post-Closure

Trench 94 will be closed and maintained after closure (the post-closure period) in compliance with WAC 173-303-610 and WAC 173-303-665(6). Closure of the burial ground in described in detail in the LLBG Dangerous Waste Permit Application (DOE-RL 1989, pp. 11-29 through 11-68). Trench 94 will be closed along with the other trenches in the 218-E-12B burial ground. Closure of 218-E-12B will occur in stages, but no closure activities will be conducted during the interim approval period. Closure of these trenches will include installation of a low permeability cover over the trenches. The cover will consist of several layers of soil and geosynthetic materials designed to minimize infiltration of precipitation to the waste. Post-closure activities will include inspection and maintenance of the cover integrity and security control devices and post-closure groundwater monitoring.

8.0 REQUEST FOR INTERIM WAIVERS

This chapter presents requests for waivers from certain chemical waste landfill requirements under 40 CFR 761.75(b) for Trench 94 for the interim approval period. Specifically, waivers are sought for a synthetic liner and leachate collection system and for groundwater monitoring.

8.1 SYNTHETIC LINER AND LEACHATE COLLECTION SYSTEM

Title 40 CFR 761.75(c)(4) allows the EPA Regional Administrator to waive one or more of the chemical waste landfill requirements under 40 CFR 761.75(b) provided that operation of the landfill will not present an unreasonable risk of injury to health or the environment from PCBs. Compliance of Trench 94 operations with the requirements under 40 CFR 761.75(b) was addressed in Chapter 7.0. As shown in Chapter 7.0, Trench 94 operations comply with all applicable requirements except for a synthetic membrane liner [40 CFR 761.75(b)(2)] and leachate collection system [40 CFR 761.75(b)(7)].

The risk analysis performed in Chapter 6.0 has shown that there will be no risk to human health or the environment from PCBs as long as the PCBs remain in the SRC. It was also shown that the PCBs will remain in the SRCs as long as there is not a breach of the SRC. For the interim approval period, it was concluded that a probability of a breach of the SRC was extremely remote, given the high structural strength of the SRC package and the slow corrosion rate of the SRC. In addition, operational practices (e.g., inspections) are in place to provide early warning of potential SRC degradation during the interim approval period. On the basis of this analysis, it is concluded that operation of Trench 94 during the interim approval period without a synthetic liner and leachate collection system does not present an unreasonable risk of injury to health or the environment from PCBs. A waiver from these requirements is, therefore, requested.

8.2 GROUNDWATER MONITORING

As discussed in Section 7.6, a groundwater monitoring system is in place at the burial ground. This system was developed to address the requirements for dangerous waste monitoring systems under WAC 173-303-645. It was not specifically designed to comply with TSCA groundwater monitoring requirements under 40 CFR 761.75(b)(6), although it does comply with many of those requirements.

Under paragraph 9.c of the Memorandum of Agreement between the DOE-RL and EPA Region 10 concerning disposal of SRCs at Trench 94, groundwater monitoring requirements are waived for the interim approval period if the DOE-RL demonstrates that PCBs will not reach groundwater during this period. As noted above, the analysis performed in Chapter 6.0 shows that chance of PCB release from the SRC during the interim approval period is extremely remote. Furthermore, the information previously presented shows that the vadose zone

travel time is many times greater than the interim approval period[1] and that any PCBs in the groundwater would have a high probability of being adsorbed in the soil. On the basis of this information, it is concluded that PCBs will not reach groundwater during the interim approval period.
A waiver from groundwater monitoring requirements for the interim approval period is, therefore, requested.

[1]The travel time analysis neglects the affects of retardation in the vadose zone. The PCBs are known to be highly attenuated in soils and the actual travel time for PCBs would be many times greater than the vadose zone travel time.

9.0 REFERENCES

DOE, 1987, *Final Environmental Impact Statement, Disposal of Hanford Defense High-Level, Transuranic, and Tank Wastes,* DOE/EIS-0113, Volume 1, U.S. Department of Energy, Washington, D.C.

DOE-RL, 1989, *Low-Level Burial Grounds Dangerous Waste Permit Application,* DOE/RL 88-20, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

EPA, 1986, *Test Methods for the Evaluation of Solid Waste: Physical/Chemical Methods*, SW-846, 3rd ed., U.S. Environmental Protection Agency, Washington, D.C.

Last, G. V., B. N. Bjornstad, M. P. Bergeron, D. W. Wallace, D. R. Newcomer, J. A. Schramke, M. A. Chamness, C. S. Cline, S. P. Airhart, and J. S. Wilbur, 1989, *Hydrogeology of the 200 Areas Low-Level Burial Grounds - An Interim Report*, PNL-6820, Pacific Northwest Laboratory, Richland, Washington.

Navy, 1984, *Final Environmental Impact Statement on the Disposal of Decommissioned, Defueled Naval Submarine Reactor Plants*, Volume 1, U.S. Department of the Navy, Washington, D.C.

WSDOT 1988, *1988 Standard Specifications for Road, Bridge, and Municipal Construction*, Washington State Department of Transportation, Olympia, Washington.

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APPENDIX A - PLATES

Plate A-1 Topographic Map, Low Level Burial Grounds, Drawing No. H-2-99274, Sheet 8 of 11

Plate A-2 Dry Waste Burial Ground 218-E-12B, Naval Disposal, Drawing No. H-2-33276, Sheet 6 of 6

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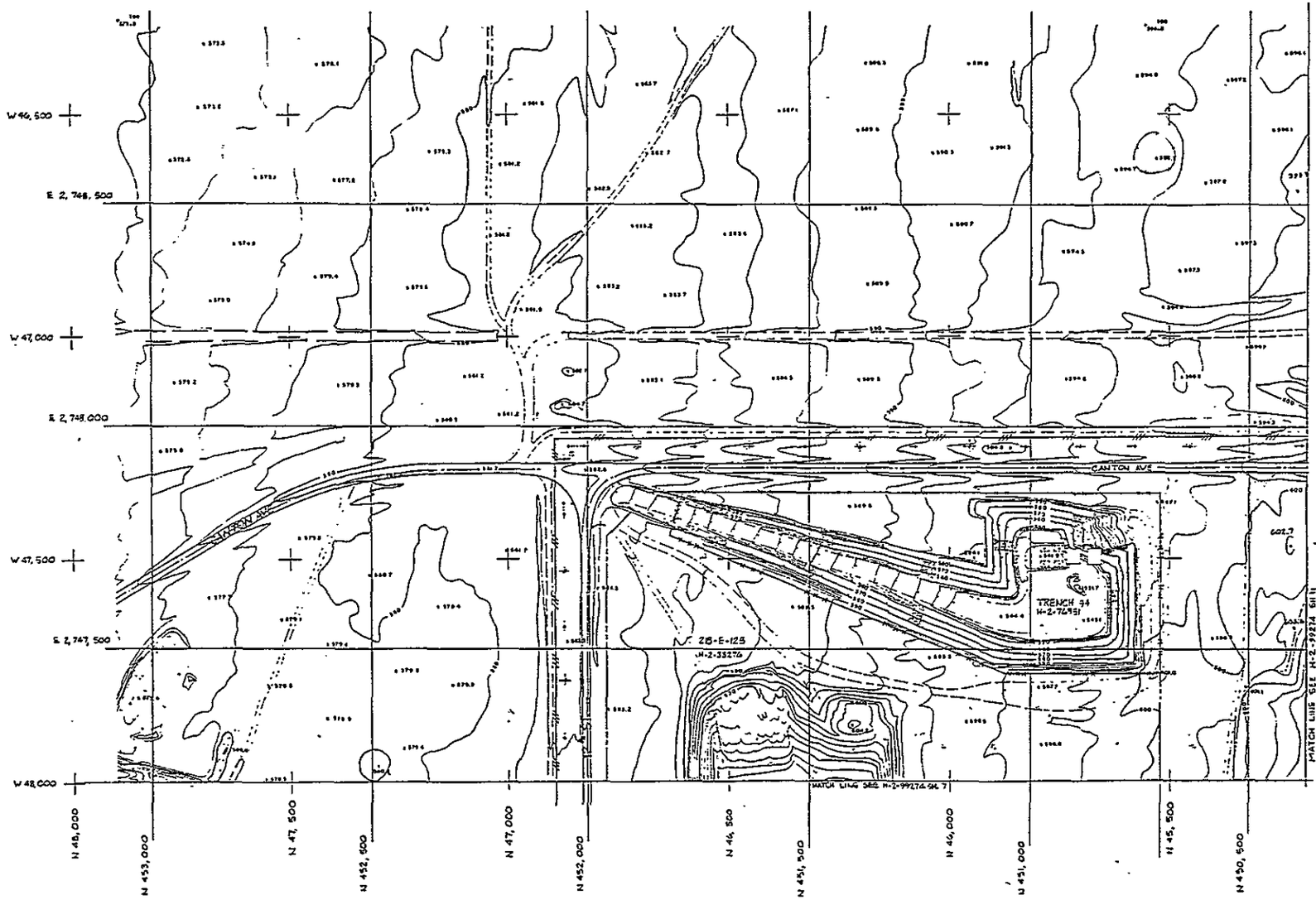


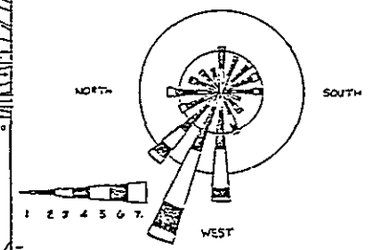
N

LEGEND

- AREA PERIMETER
- BURIAL GROUND BOUNDRY
- CONTROLLED AREA
- W46,500 HANFORD PLANT COORDINATES
- N47,500
- E 2,748,500 WASHINGTON STATE COORDINATES
- N453,000

WIND ROSE FOR : 200E AREA
% CALM WINDS 5.9

PERIOD COVERED
12/31/53 - 12/31/67
STATION NUMBER 6



PADDLES INDICATE DIRECTION WIND IS COMING FROM.
RADIAL GRIDS REPRESENT 5.0% AND 10.0 % OCCURRENCE

WIND CLASS	MILES/HOUR
1	>1.0-3.0
2	4.0-7.0
3	8.0-12.0
4	13.0-18.0
5	19.0-24.0
6	25.0-31.0
7	32.0 +

SITE PLAN

SCALE : 1" = 100'-0"
CONTOUR INTERVAL = 2'-0"

OFFICIAL RELEASE
BY WHC
DATE
JAN 24 1989

DATE OF PHOTOGRAPH 7-18-88

		H-2-99274	CIVIL SITE PLAN
		H-2-33276-2	DRY WASTE BURIAL GROUND
H-2-33276-2	DRY WASTE BURIAL GROUND	H-2-33276-1	DRY WASTE BURIAL GROUND
H-2-33276-1	DRY WASTE BURIAL GROUND		
Dwg. No.	Title	Dwg. No.	Title
DRAWING TRACEABILITY LIST		REFERENCE DRAWINGS	
		NEXT USED ON H-2-99275-2 SH 1	

No.	Description	By / Date	Checked	Eng. Approval	Other	Other
		APPROVALS & DATE				

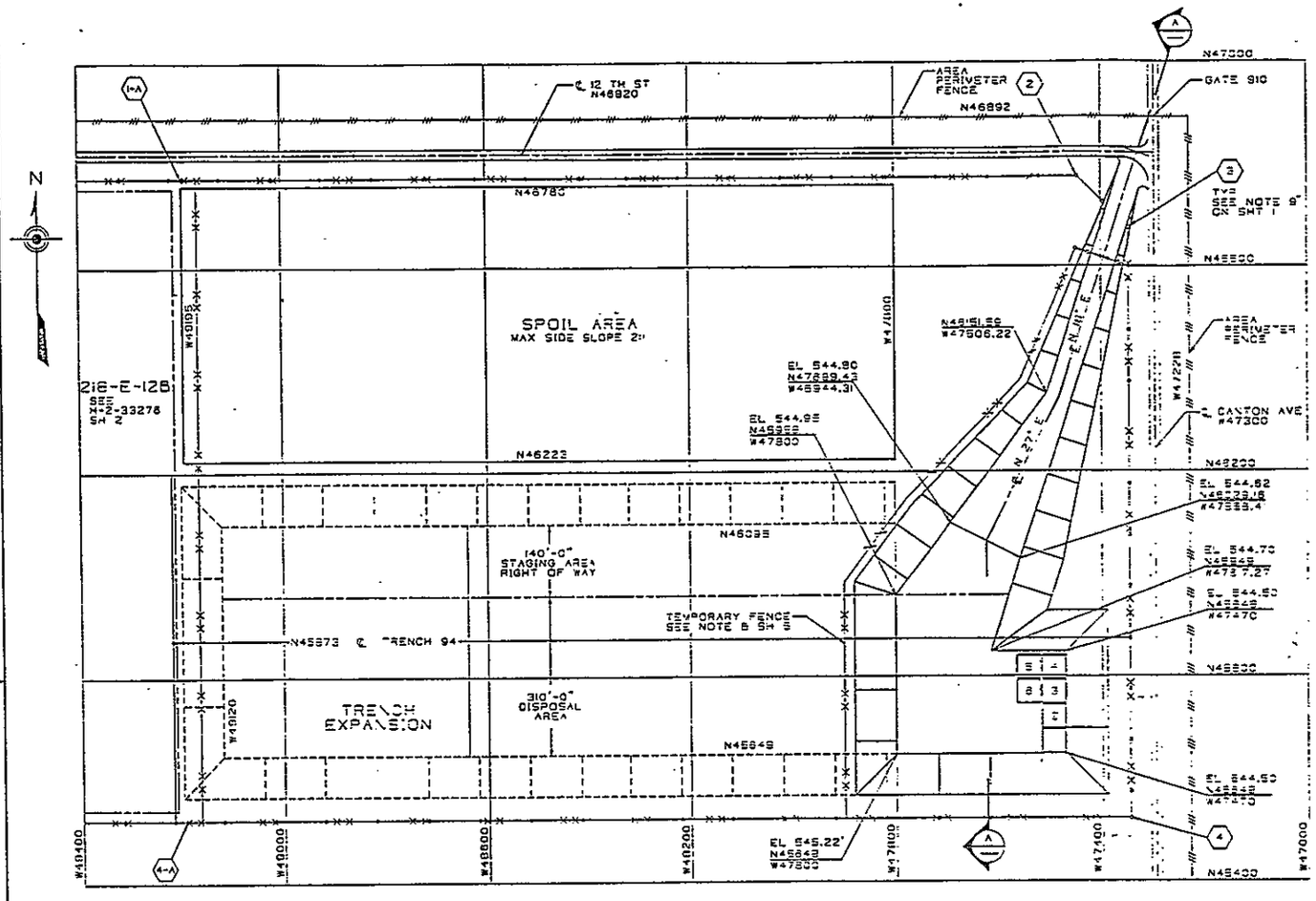
REVISIONS

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

Westinghouse Hanford Company

TOPOGRAPHIC MAP
LOW LEVEL BURIAL GROUNDS

F	12CE10401	H-2-99274	0
Scale AS SHOWN		Drawing No.	



SITE PLAN

SCALE: 1" = 100'-0"

SPECIAL NAVAL DISPOSAL NOTES

(FOLLOWING NOTES APPLY ONLY TO THIS SHEET OF THIS DWG)

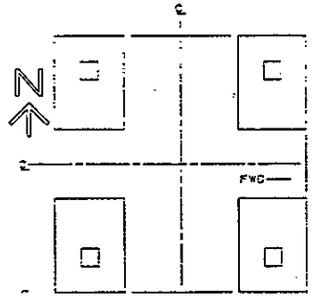
A. THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION (WSDOT) DOCUMENT, M41-10-88, (STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION) SHALL BE USED TO BUILD OR CONSTRUCT ALL ROADWAYS IN ALL OR PART THEREOF.

B. A TEMPORARY FENCE WITH STEEL POSTS AND CHAIN SHALL BE INSTALLED AROUND THE ACTIVE BURIAL SITE UNTIL ALL ACTIVE WORK IS COMPLETED AND BACKFILLED AND TOP OF GROUND IS STABILIZED WITH PERMANENT POST AND CHAIN INSTALLED AROUND THE AREA. THE TEMPORARY FENCE SHALL HAVE RADIATION SIGNS PER HPS-AC-3-25 AT 100' MAX SPACING (32 SIGNS REQD).

C. CONSTRUCTION TOLERANCE: HORIZONTAL DISTANCE AND COORDINATES SHALL HAVE A TOLERANCE OF ±1.0 FT. ELEVATION SHALL HAVE A TOLERANCE OF ±0.02 FT.

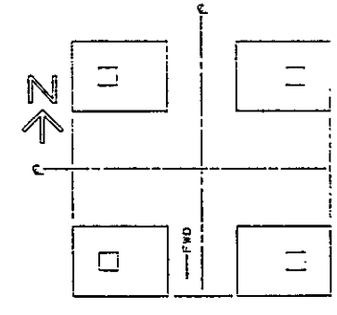
FOUNDATION TABLE

BURIAL NO.	FOUNDATION DETAIL DWG	NORTH COORDINATE	WEST COORDINATE	T.O.C. ELEV.	FON PLAN NO.	SUBSIDING REACTOR COMPARTMENT
1	H-2-98277	N45873.00	W47495.00	544.50	A	PATRICK HENRY
2	H-2-98277	N45720.69	W47495.00	544.50	A	SNOOK
3	H-2-98277	N45785.88	W47495.00	544.50	A	GEORGE WASHINGTON
4	H-2-98277	N45817.03	W47495.00	544.50	A	SCAMP
5	H-2-98277	N45887.03	W47543.84	544.50	A	ROBERT E. LEE
6	H-2-98277	N45788.88	W47547.04	544.50	A	THOMAS JEFFERSON



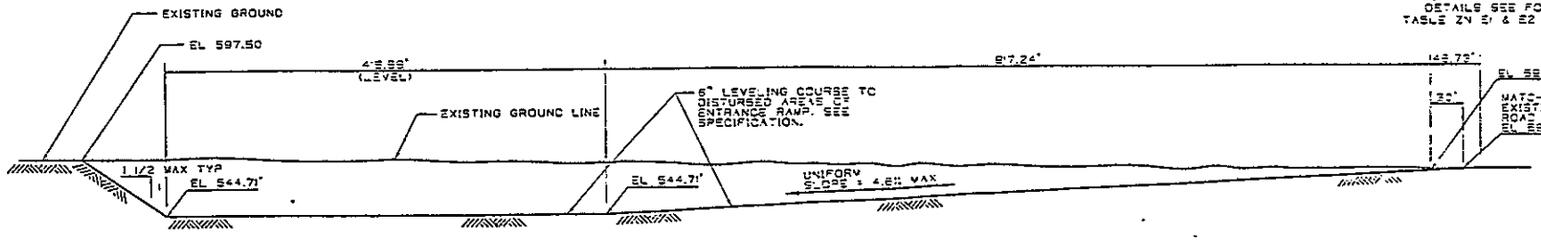
FOUNDATION PLAN A

SCALE: 1" = 10'-0"
FOR FOUNDATION SIZE AND DETAILS SEE FOUNDATION TABLE ON SHEET 2 & 2 THIS SHEET.



FOUNDATION PLAN B

SCALE: 1" = 10'-0"
FOR FOUNDATION SIZE AND DETAILS SEE FOUNDATION TABLE ON SHEET 2 & 2 THIS SHEET.



SECTION (A)

SCALE: 1" = 50'-0"

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BY ECN #103461

U. S. Department of Energy
Richland Operations Office
Westinghouse Hanford Company

DRY WASTE BURIAL GROUND 218-E-12B NAVAL DISPOSAL

H-2-33276 0

DWG NO.	TITLE	REFERENCES
H-2-98277	MAP FOR PLAN & SECT	H-2-76951 EXCAVATION CONSTRUCTION SPEC
H-2-76951	NAVAL DISPOSAL	

REVISIONS

DRAWING TRACEABILITY IS: NEXT USED ON H-2-33278 SHT 2

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APPENDIX B

SUBMARINE REACTOR COMPARTMENTS

PLACED IN TRENCH 94

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APPENDIX C - CROSS-REFERENCE OF REGULATORY REQUIREMENTS UNDER 40 CFR 761, WAC 173-303, AND 40 CFR 264

Cross-Reference of Regulatory Requirements Under 40 CFR 761, WAC 173-303, and 40 CFR 264

General Requirements	40 CFR 761 Citation	WAC 173-303 Citation	40 CFR 264 Citation
Technical Requirements			
• Soils	40 CFR 761.75(b)(1)	No equivalent requirement	No equivalent requirement
• Synthetic membrane liners	40 CFR 761.75(b)(2)	WAC 173-303-665(2)(a)	40 CFR 264.301(c)
• Hydrologic conditions			
- Floodplain	40 CFR 761.75(b)(3)	WAC 173-303-420(4)	40 CFR 264.18(b)
- Shoreline	40 CFR 761.75(b)(3)	WAC 173-303-420(5)	No equivalent requirement
- Groundwater recharge areas	40 CFR 761.75(b)(3)	WAC 173-303-420(6)	No equivalent requirement
- Hydraulic connection with groundwater and surface water	40 CFR 761.75(b)(3)	No equivalent requirement	No equivalent requirement
- Depth to water table	40 CFR 761.75(b)(3)	No equivalent requirement	No equivalent requirement
• Flood protection	40 CFR 761.75(b)(4)	WAC 173-303-665(2)(c)	40 CFR 264.301(f)
• Topography	40 CFR 761.75(b)(5)	WAC 173-303-283(3)(g)	No equivalent requirement

Cross-Reference of Regulatory Requirements Under 40 CFR 761, WAC 173-303, and 40 CFR 264

General Requirements	40 CFR 761 Citation	WAC 173-303 Citation	40 CFR 264 Citation
• Monitoring systems			
- Water sampling	40 CFR 761.75(b)(6)(i)	WAC 173-303-645(8)	40 CFR 264.97
- Groundwater monitor wells	40 CFR 761.75(b)(6)(ii)	WAC 173-303-645(8)	40 CFR 264.97
- Water analysis	40 CFR 761.75(b)(6)(iii)	WAC 173-303-645(9)	40 CFR 264.98
• Leachate collection	40 CFR 761.75(b)(7)	WAC 173-303-665(2)(a)	40 CFR 264.301(c)
• Landfill operations			
- Container management	40 CFR 761.75(b)(8)(i)	No equivalent requirement	40 CFR 264.315
- Operation plan	40 CFR 761.75(b)(8)(ii)	No equivalent requirement	No equivalent requirement
- Management of ignitable waste	40 CFR 761.75(b)(8)(iii)	WAC 173-303-140(4)(c)	40 CFR 264.312
- Records	40 CFR 761.75(b)(8)(iv)	WAC 173-303-665(5)	40 CFR 264.309
• Supporting facilities			
- Fence	40 CFR 761.75(b)(9)(i)	WAC 173-303-310(2)	40 CFR 264.14(b)
- Roads	40 CFR 761.75(b)(9)(ii)	No equivalent requirement	No equivalent requirement
- Safety hazards	40 CFR 761.75(b)(9)(iii)	WAC 173-303-283(3)	No equivalent requirement

Cross-Reference of Regulatory Requirements Under 40 CFR 761, WAC 173-303, and 40 CFR 264

General Requirements	40 CFR 761 Citation	WAC 173-303 Citation	40 CFR 264 Citation
• Recordkeeping Requirements			
- Manifest and certificates of disposal	40 CFR 761.180(b)(1)	WAC 173-303-370(2)(e)	40 CFR 264.71(a)(5)
- Annual document log	40 CFR 761.180(b)(2)	WAC 173-303-380(1)	40 CFR 264.73
- Annual report	40 CFR 761.180(b)(3)	WAC 173-303-390(2)	40 CFR 264.75
- Water analyses	40 CFR 761.180(d)(1)	WAC 173-303-380(1)(f)	40 CFR 264.73(b)(6)
- Waste burial coordinates	40 CFR 761.180(d)(2)	WAC 173-303-665(5)	40 CFR 264.309
- Documents, data, correspondence pertaining to PCB disposal	40 CFR 761.180(f)	No equivalent requirement	No equivalent requirement

EXPECTED TIME FOR REACTOR COMPARTMENT PACKAGE BREACH

Evaluate how long the reactor compartment packages are predicted to maintain total containment of the lead in the specific environment of the burial trench, without presuming any cap is placed at trench closure.

Lead shielding is incorporated into the ship's bulkhead and hull structure during initial construction. Most of the lead is contained in over 1,000 individual steel enclosed panels which make up the reactor compartment structure. Some of the lead is permanently bonded to components. In a typical compartment, there are over 100 tons of lead distributed in this manner. Because the actual weight and specific installation details of the lead are not publicly releasable due to their military sensitivity, the DOE-RL RCRA Part A Disposal Facility permit application very conservatively assumed that the entire 1,000 ton reactor compartment disposal package weight was lead.

Of all the lead present, approximately one-fourth is isolated from the environment by a single steel panel barrier which ranges in thickness from three-eights to one-half inch. The remaining lead is located deeper within the structure behind additional steel bulkheads and panels, or behind the hull itself. All this remaining lead is contained by well over one inch of steel.

The soil in the arid Hanford environment is relatively dry and is slightly alkaline. The common range of field moisture tests of soil at the Hanford 200E area is from two percent to six percent. The expected maximum corrosion rate for steel in this soil is one mil (0.001 inches) per year. For study purposes, some documents such as the draft EIS for decommissioning the surplus Hanford production reactors, conservatively assume iron would corrode at an accelerated rate of 5 mils (0.005 inches) per year (C.1.2, DOE/EIS-0119D). The National Association of Corrosion Engineers Reference Book lists corrosion rates determined from carbon steel calibration specimens at a variety of open air locations. A typical steel corrosion rate rate for rural arid environments (Phoenix, Arizona) is listed as 0.18 mils (0.00018 inches) per year. ASTM Special Technical Publication 741, titled Underground Corrosion, reports the results of an eight year evaluation of buried steel tanks at service stations in Chicago, Illinois, under galvanic protection. The general results showed that when the tanks were cathodically protected with sacrificial magnesium anodes, essentially no corrosion occurred. Conversely when the cathodic protection was disconnected on one of the tanks for a period of about 1.5 years, corrosion did occur at a rate of 1.3 mils (0.0013 inches) per year. This rate was attributed to the tank environment, a moderately corrosive soil, a condition not encountered at Hanford. Thus, for the disposal packages at Hanford in a trench without a moisture protection cap, it can be concluded that even if a worst case 5 mil rate is assumed, no lead will be exposed for seventy five years. Using more realistic corrosion rates, the lead will be fully contained for a much longer time, perhaps hundreds of years or longer.

Enclosure (1) to ltr
2300.1/9211/30/2
RJB:3886-89

The use of a RCRA trench cap is planned for the RC disposal package trench. These moisture barrier caps are designed to virtually eliminate the normally assumed 0.5 centimeter per year ground water recharge rate of moisture percolating vertically through the burial trench. However, for conservatism, studies such as Appendix H, of DOE/EIS-0119D assume that some moisture is able to penetrate the barrier at a recharge rate of less than 0.1 centimeter per year. This use of a barrier cap to preclude moisture, and the absence of any mechanism to remove the rust and continue the corrosion, will significantly extend the time to corrode through the steel which contains the lead.

Even though the overall soil conditions are not conducive to corrosion; because of some reports of steel tank failures at Hanford (apparently from highly localized conditions including internal corrosion caused by caustic materials), the possibility of localized anodic/cathodic corrosion cells cannot be completely ruled out. Although such phenomena is highly unlikely to be encountered in trench 94 where the chemically inert RC packages are the only contents of the trench, the Shipyard proposes to install sacrificial zinc cathodic protection to provide positive assurance against such a possibility.

In view of the above, it is not unreasonable to expect that the lead will be fully contained by the steel package for well over one thousand years. In comparison, the RCRA trench liner and leachate collection and recovery system required by the State of Washington Dangerous Waste Regulations, are only required "...during the active life (including the closure period) of the landfill." Literature indicates that the typical life expectancy of these systems would be about 40 years.

Thus, the protection of the environment from lead by the heavy steel containment boundary of the reactor compartment disposal package will significantly exceed that provided by a RCRA trench liner and a leachate collection system.